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OF  
THE HIGHLAND AND AGRICULTURAL  
SOCIETY OF SCOTLAND

WITH  
AN ABSTRACT OF THE PROCEEDINGS AT BOARD AND  
MEETINGS, AND THE PREMIUMS OFFERED BY  
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\* \* \* *It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the Writers whose Papers are published in the 'Transactions.'*

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# TRANSACTIONS

OF

## THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

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### FARM BUILDINGS.

By JAMES COBBAN, Architect and Surveyor, Haddo House,  
Aberdeenshire.

THE size and number of buildings necessary for the occupation and economic working of a farm must of necessity vary in size and arrangement according to the extent of the farm, the nature of the principal crops, and the method of management under which the farm is carried on, as well as the situation of the ground on which the farm buildings are placed.

The farm which under one method of working maintains a certain number of live-stock and necessitates the labour of so many horses, may, perhaps, under a different system of farming, support a different number of animals, and thus require distinctly different buildings. For example, on a farm where the principal object is the feeding of cattle, prominence will be given to the feeding-byres, in seeing that they are most conveniently situated to be workable with as little labour as possible from the straw-barn, the turnip-sheds, and mixing-troughs. A great deal of labour is saved by the economical arrangements of the various compartments, and it will usually be found that the barn is the key to the whole situation in this kind of steading. Then, again, on a farm where horse-breeding is carried on largely, the principal items of the steading, apart from storage accommodation, will be the stables and loose-boxes.

This paper, however, will deal principally with buildings on farms where mixed farming is carried on, mostly in rearing and feeding cattle, with in some cases a limited number of sheep.

*Site.*

In considering the site, it is well to see that the outlook is good, either south or south-west in Scotland at least, and the situation should be free from damp and be sheltered, yet airy, if possible. Of great importance also is the water-supply, which will be dealt with further on. It is needless to add that the buildings should be as near to the centre of the farm as possible, and that they should abut on a hard road; it may be a public road, service or private road, but a hard road if possible, otherwise additional outlay will have to be incurred in making a new road. Should it be a public road, the nearest building, according to the County Council (Scotland) Act, should be at least 25 feet from the middle of the roadway, except by special permission of the County Council—that is for buildings over 7 feet in height.

Another very important consideration, which is often overlooked until too late, is the placing of the threshing-floor or sheaf-barn. In farms where the threshing of grain is done at short intervals, as may be required, whether the machinery is driven by natural or mechanical means, it greatly facilitates the work if the level of the floor can be kept at the same level as the outside ground, allowing the horse and cart-load to either be backed into the barn or go in altogether and “coup” the load. This of course is possible only when the steading is placed on sloping ground, with the barn and mill buildings on the highest elevation. To put it shortly, an immense advantage is gained if a difference of say from 6 to 15 feet can be got from the level of the sheaf-barn floor to the level of the straw-barn and byre floors. This advantage is appreciated only by those who know what a saving in labour it effects.

*Cost.*

The cost of farm buildings varies considerably in different districts, being subject a good deal to the price of labour and materials. It may be taken that three-fourths of the steadings and dwelling-houses on farms in Scotland are built of stone-and-lime walls with slated roofs, either Scottish or Welsh slates. It might here be mentioned that Scottish slates, with the exception of Ballachulish and Eastdale slates, are of much poorer quality than the Welsh slates, which are therefore used extensively over a large part of the country, and which vary in price according to where the district is situated, in particular whether near to or far from a seaport. Supposing the slates have to be brought fifty miles by rail, the slating of a steading of a one-pair-horse farm would cost about £8 more than the slating

of a steading near to a seaport town; that is equal to about 7s. a rood of difference. The same rate applies also to the timber, if foreign timber is used; likewise in many cases to lime, should it happen that lime is not manufactured in the near neighbourhood.

It is obvious, therefore, that it is impossible to fix a standard price of farm buildings on any scale whatsoever. Neither would it be satisfactory to attempt to lay down more than general rules as to the proportion of capital necessary to invest in buildings for any particular class of a farm. The class of building, the local circumstances, extent of the farm, and the value of the land all tend to disturb calculations.

Then, again, it is the common practice on most estates in this country for the tenant to be required to do all cartages and hauling in connection with new buildings at his own expense. The figures given below are therefore exclusive of this item, which, if added, would increase the total cost by from seven to eight per cent, according to the distance from the nearest railway station. Moreover, the prices quoted do not take into account distances greater than forty miles from the sea-board.

The following may be taken as reasonable estimates of the costs of buildings for holdings of the sizes mentioned:—

**FIFTY-ACRE HOLDING.**—A holding of 50 or 60 acres requires the sum of £495 to be spent on buildings, and this works out at the rate of £9, 18s. per acre. The dwelling-house would include kitchen, parlour, bedroom, milk-cellar, and scullery on ground floor, with two bedrooms and closet upstairs, at £190. The farm offices necessary are barn with accommodation for a small threshing-machine, a byre for about twenty-two cattle, turnip-shed, stable for three horses, man's apartment, cart-shed and small implement or tool house, houses for pigs and poultry, and in some cases a loose-box, with loft over cart-shed, tool-house, and part of barn. The total cost here would be £305.

**HUNDRED-ACRE HOLDING.**—Coming to the 100-acre farm, one finds that the average cost for dwelling-house is at least £275. This seems little enough compared with the cost for the smaller places, but the figures are based on the actual cost of houses for places of this size built within the last five years. The house would consist of kitchen, living-room, parlour, bedroom, scullery, and milk-cellar on ground floor, with two or three bedrooms and perhaps a good-sized closet upstairs. The steading should have a barn of about 100 superficial yards of floor, or about 55 by 16 feet, a byre for thirty-six or thirty-seven cattle, with turnip-shed, stable for four or five horses, loose-box, and hay-house; then a cart-shed, implement-shed,

men's room, houses for pigs and poultry, &c. The cost of this runs to almost £480, making a total of £755, or £7, 11s. per acre.

**THREE-HUNDRED-ACRE HOLDING.**—A holding of 300 acres requires a deal more money than has been mentioned in connection with smaller places. The dwelling-houses on a farm of this size usually includes three rooms, used as dining- and drawing-rooms and a parlour or nursery, kitchen, scullery, two pantries, milk-cellar, and servants' bedroom, &c., on ground floor, and five or six bedrooms and perhaps a bathroom and lavatory on upper floor. Unless the circumstances in each case are known, it is difficult to fix the precise outlays, but a house of this size usually costs on an average about £560.

The steading, which of course must differ according to circumstances, but only in degree, should consist of a barn and granary of sufficient size for the needs of the place, then accommodation for at least 100 head of cattle, stable for six or seven horses, colt and pony stable, loose-box, bull-house, cart-sheds, houses for implements and tools, and turnip-sheds. Single men's apartment would also be provided. The cost of this, as closely as may be, would be £1020, so that the total for the house and the steading would reach £1580; equal to £5, 5s. 4d. per acre.

**FIVE-HUNDRED-ACRE FARM.**—For a farm of about 500 acres the dwelling-house will cost £810, and should consist of dining- and drawing-rooms, parlour, nursery, a double kitchen, scullery, servants' rooms, three pantries, and milk-cellar on ground floor, and five or six bedrooms, with bathroom and two closets, upstairs.

The steading for this farm would consist of barn and granary, byres for from 150 to 170 head of cattle, a few loose-boxes, cattle-shed or covered court, stable for ten or twelve horses, colts' stable for five or six, pony stable for three horses, turnip-sheds, cart-sheds, hay-house and coach-house, houses for implements and tools, houses for poultry and pigs, engine-house, men-servants' accommodation, &c. The cost here would be about £1800, or in all £2610; equal to about £5, 4s. per acre.

#### BUILDINGS FOR ONE PAIR OF HORSE FARM.

In fig. 1 is the ground plan of a steading for a farm of from 50 to 60 acres. With the rearing and feeding of cattle as the main source of revenue, the byre is placed so that the feeding of the cattle is managed from each end with direct communication to the straw-barn and the turnip-shed.

The stable has three stalls, with one of the travises made movable so that at any time two of the stalls may form a loose-box if necessary. Implements and carts are provided

for, and over these sheds and part of the barn loft accommodation is to be had for about 50 to 60 quarters of grain, hay seed, &c.

The barn is of sufficient size to allow of a small threshing-machine being put in, and if no water-power is available a small

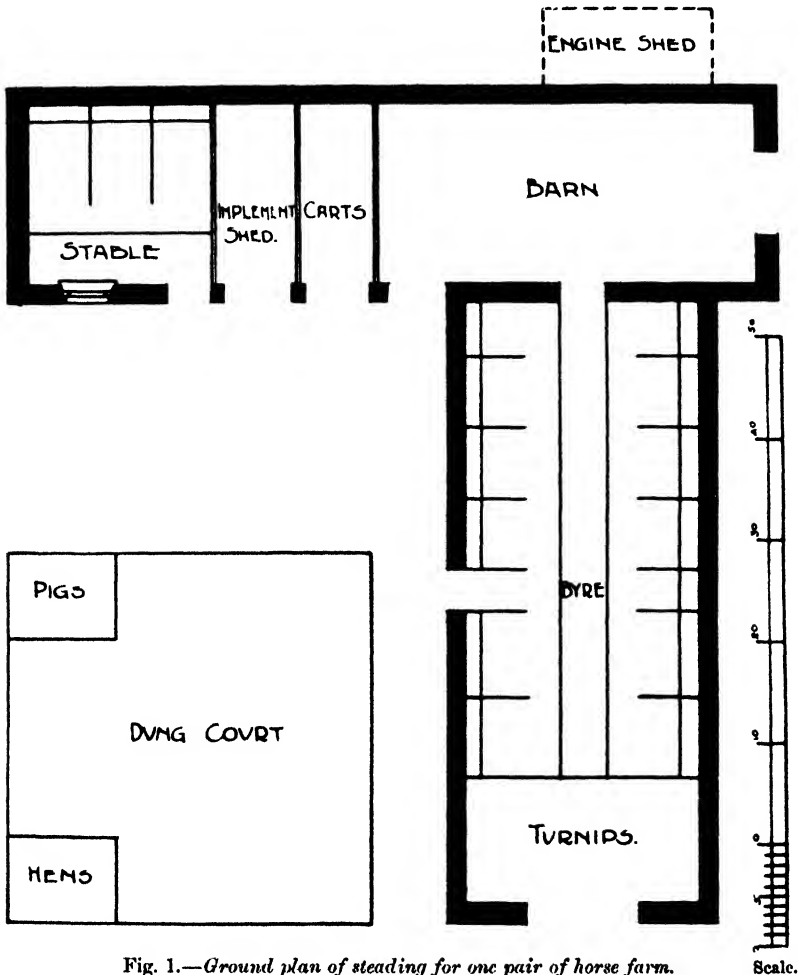


Fig. 1.—Ground plan of steading for one pair of horse farm.

oil-engine can conveniently be attached and fitted up in a small building of corrugated iron with a cement foundation and floor.

Poultry and pigs find housing accommodation in the corners of the court: stone walls and slated, sloping roofs.

The whole cost is about £305.

## BUILDINGS FOR TWO-PAIR-HORSE FARM.

Fig. 2 shows the ground plan of a steading which would suit a two-pair-horse farm, or say from 120 to 160 acres. The dwelling-house is shown in fig. 3.

The barn wing and cart-sheds should be about 100 feet long, with two double byres placed equidistant from each end, thus allowing free access to the straw-barn from each byre. The byres should have accommodation for about sixty cattle, with a turnip-shed on the end of each byre. The roofs of the double byre are carried by a steel beam supported at intervals by metal columns.

At right angles and in line with the byres are built out stable and men's room on one side and tool-house, loose-boxes, &c., on the other. The space between the loose-box wing and the sheaf-barn may be filled and roofed for covered court; implement-shed of wood framing and corrugated iron.

A small engine-shed is fitted up where shown, suitable for an oil or other engine. The granary is 45 feet long and 16 feet wide, capable of holding from 90 to 100 quarters of grain.

A small wing contains pony stable, gig-shed, poultry-house, &c.

The cost of these buildings is about £775.

## BUILDINGS FOR FOUR-PAIR-HORSE FARM.

Fig. 4 gives the ground plan of a steading suitable for a four-pair-horse farm, or about 350 acres. This steading, which was built on a farm where the prominent features are the rearing and feeding of cattle for the market, is favoured with an ideal site as far as economy in building is concerned. Except at the corner from A to B, the whole site is almost level; if anything there is a declivity towards the south, thereby giving a splendid drainage arrangement.

Altogether in this steading 120 head of cattle, besides calves, can be tied up, and a number might be put into the covered court if necessary. Two large turnip-sheds and one small one are placed at the byres, and provision easily got for more turnips and green foods in the court. There are also open lofts over the sheds for storing food-stuffs. A stable for eight horses (with hay-house and loft adjoining) is sufficient for the working of this kind of farm in the usual rotation.

In a detached wing there is found room for single men's apartments, tool-house, three loose-boxes, with a spare shed for straw, &c. The whole wing is lofted over, and there seeds, roots, and food may be kept.

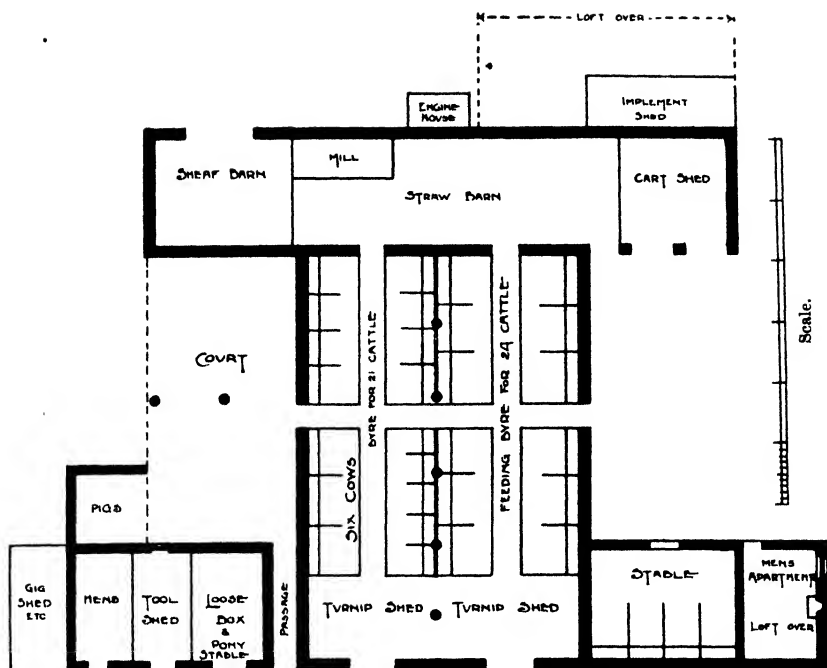


Fig 2.—Ground plan of steading for two pair of horse farm.



Fig. 3.—Dwelling-house for two pair of horse farm.

The barn in this case guided the whole planning of the steading. The level of sheaf-barn door is 15 feet above the level of the straw-barn and the floors of the byres, and this permitted of the threshing-mill being placed in such a position as to allow the top of the mill to be on a level with the floor of the sheaf-barn, and in this case with feeding-bench also, suffi-

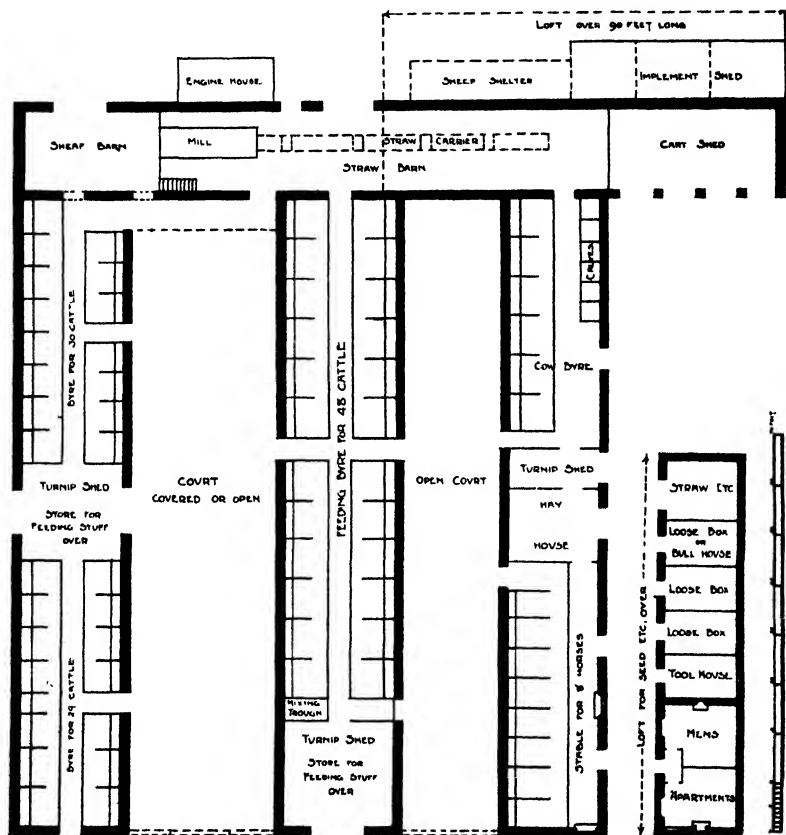


Fig. 4.—Steading for a four pair of horse farm.

Scale

cient space being sunk into the floor to admit of the feeder doing his work either in a sitting or standing position. The straw is taken away by a straw-carrier driven off the mill, and the corn is elevated to the loft and distributed by a spout. The chaff-house is under the sheaf-barn. As will be seen from the plan, access is had to the straw-barn, under cover, from all the other wings of the steading, and this all on the same level.

An engine-house is provided, suitable for almost any kind of

engine—in this case it is a vertical steam-engine. The implement-sheds and sheep-shelters are of wood framing, covered with corrugated iron and lean-to roofs of the same. Pony stable, coach-house, &c., are provided nearer to the dwelling-house.

The whole of the buildings are of stone-and-lime walls and slated roofs, except the court, which may have the roof of corrugated iron either curved or pitched. The roofs are framed

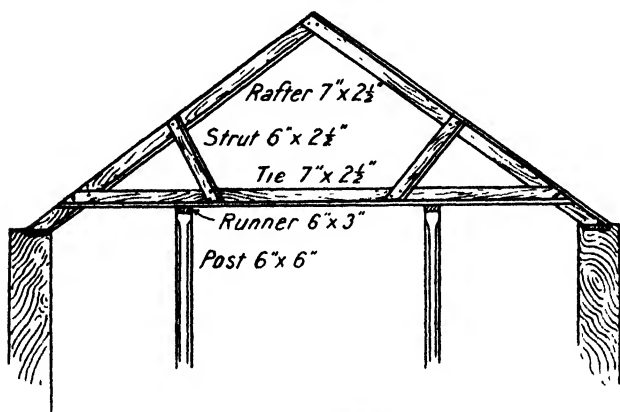


Fig. 5.—Roof of steading.

common rafter-fashion, as in fig. 5; for the wide spans the rafters are 7 by 2½ inches.

Ventilation is provided by fresh-air inlets in the side walls, and by Beattie's Patent "Swift" ventilators in roofs of all the buildings.

The floor of the stable is of granite setts, and the byres of causeway, with concrete passages.

The cost of these buildings was £1590.

#### BUILDING AND CONSTRUCTION OF A STEADING.

The plans and specifications having been drawn up to the satisfaction of those concerned, tradesmen's estimates should then be taken. In every-day practice it is unusual to have a schedule of quantities for farm steadings, the reason being that the work is as a rule carried out by country tradesmen, and they are not so well accustomed to estimating in this way. Should they have to offer for scheduled work it is found that their estimates are higher than if they are allowed to take their own figures, measured from the plans by themselves and counted up in their own way.

Which of the estimates should be accepted is of much importance. The lowest estimate may be given by a contractor who may be a very good tradesman and carry out the work in a very satisfactory fashion, or it may be quite the opposite. A few pounds more or less may make all the difference between good work and bad work, which may not be detected at the time of building, but may mean more expenditure later on.

### *Avoid "Extras."*

Care should also be taken that the conditions of contract are quite correct, otherwise there is the chance that "extras" may creep in, and every one knows what that means. Extras may be defined as anything not included in the original contract. It will then be a question what the original contract includes, for, if the contract is entire, any work indispensably necessary to complete the whole, although not specially mentioned, is included therein and is not extra. Still works provided for by an entire contract may be altered or added to, and an obligation may arise to pay such alterations and additions, this all depending on what the alterations and additions are and how they were ordered. A stipulation should be inserted that all such orders be made in writing by the employer or other responsible person.

### *Mortar.*

Assuming, then, that the estimates are satisfactorily settled, the cartages of sand, &c., along with the excavations, should first claim the attention of the farmer and contractor. The mortar will also claim early attention, and should consist of the very best quality of lime-shells, at the rate of not less than one ton of lime to the rood of building (36 square yards to the rood), the sand to be clean and sharp, and the whole sifted together dry and mixed with pure fresh water, soured at least twenty days before being used (longer if possible), and twice thoroughly turned over. If possible, the whole of the lime should be mixed in a large batch, and to make sure that a sufficient supply of lime has been provided, if any doubt exists as to the quantity, the contractor should be asked to produce a voucher for the quantity supplied, which should correspond in tons to the number of roods in the building.

### *Foundations.*

The foundation should be laid at not less than 18 inches below the finished surface, with a scarcement 6 inches thick

and projecting 6 inches beyond both sides of the wall, or at any greater depth that may be necessary to secure a sound and solid foundation, and to be formed of large flat-bedded stones laid on their natural beds, well bedded, bonded, and packed with lime mortar.

### *Rubble Walls.*

All the outside walls should be built of good rubble work, in courses of from 11 to 14 inches, according to whatever dimensions may be required. The greatest care should be taken with the bedding of the stones and close hearting and packing of the middle of the walls. Many masons seem to think that the hearting may be filled in the same way as one would fill a cart. This is very far wrong; the middle of the wall requires quite as much care as the outside. In the writer's experience, a wall was so badly built that by the time it had stood ten days it split down the middle, the outside falling right away and the inside remaining standing until shoved down.

To avoid anything of this nature, "header stones," or through bands, as the mason calls them, should be inserted in every course, going at least two-thirds through the thickness of the walls, laid alternately from each side, and not more than 3 feet apart. While speaking of "headers," it is well to remember that large header stones should be built into the walls opposite every travis, with plug holes bored in each. Two such stones to each travis are sufficient.

### *Dressings.*

Forty or fifty years ago, when steadings began to take their present shape, too much money was uselessly spent on the so-called dressings of steading buildings. Of course, the same dressings would have been made then for half the money they would cost to-day. It is not the stones that cost so much, it is the work that is put upon them; and money must have been more plentiful then than now, for it is found that finely-dressed corners and rybats, as well as dressed and moulded spur stones, tabling, and finials, were in many cases used.

All this is absolutely unnecessary from a utility point of view, and, except in special cases, the dressings and principal stones now enumerated are quite sufficient for all general purposes. Provided that the stones are from a good quarry (granite or freestone), the corners, rybats, door and window soles, and lintels and tabling, mean practically all the dressings that are required in an ordinary steading. If these stones are hammer-blocked—the words are quite expressive of the method of working the stone—and the outside edges and corners squared

with a chisel, so that the stones form a straight or plumb line when built on the top of each other, it will be found when finished that the masonry looks well enough. Fine dressings do not add to the solidity of the building, and therefore they may be safely omitted from the farm steading.

### *Roofing.*

The walls being now at the wall-head level, the next process is the roofing. Sizes of timber should be well considered. It is therefore assumed that the specification written by the architect or other responsible party keeps this part of the work right. But in the building of a steading, the farmer who has his own and his proprietor's good at heart will prove a power indeed when it comes to fitting up of the steading, if he gives close attention to all the work.

That all the outside wood-work should be of redwood from some of the countries around the Baltic it is almost unnecessary to mention. The inside timber not exposed to the weather may be of white wood, such as rafters, ties, and sarking. Joisting and floors, wooden partitions, and even the boarding of byre travising, heel-posts of stables, byres, or heel-posts of any description, should be of larch, redwood, or pitch pine, all of which run to about the same price. Larch is, of course, preferable, but is getting very scarce; however, with the rapid strides that are being made by way of afforestation and the teaching of forestry, this should soon be remedied.

One of the first things the carpenter will have to do is to lay the joists of the loft, and it is well to see that these are strong enough. In a single wing, joists 10 in.  $\times$  2½ in. or 9 in.  $\times$  3 in. are quite sufficient, if the wing is not wider than 17 feet inside. These joists should never be more than 18 inches apart, and with at least 9 inches of wallhold.

The roofing should be strongly and carefully framed together, care being taken that the joinings of couples and ties are securely nailed, and the nails long enough to rivet. The sarking should be driven tight, each board on the lower one, and each board double-nailed; band should be broken at least every 30 inches—that is, not more than five boards should finish on any one couple. The reason for this is that, should any tiers of slates happen to land on this joint, then for five courses the slates only get one nail at that point, and with double-nailed slates it means that the slates are inclined to swing out with a gale of wind. Skew-plates and fillets should be placed at all endings and joinings, thus facilitating the work of the slater when the skews come to be pointed.

During the time the roofs are being got in order, it is most

advisable that the mason should remain and finish the work of his department inside of the steading. This is just mentioned, as experience has shown that if once a tradesman is let away from a building there is some difficulty in getting him back. In country districts the time for building is necessarily limited, from April to October, and the farmer is lucky who gets everything done within this time.

If the mason stays on, he has still the fore-stall, causewaying, &c., to be attended to. The fore-stalls may be according to a recognised size and height, or to any dimensions fixed upon. Difference of opinion exists as to this, but built they have to be, and one of the principal things is that they have a good foundation. Then the placing of bases is another thing which requires a sure foundation.

As the horses require shelter first, it is well that the floor of the stable should be taken in hand early.

### *Floor of Stable.*

Undoubtedly the best and most satisfactory floor for a stable would be granite setts, and although in the majority of cases the price makes it prohibitive, it is considered that in a large steading where a well-equipped stable is expected to be found, or in a coach or pony stable where neatness and cleanliness are absolutely necessary, it is well worth considering the question of granite setts first.

Failing to have the whole of the floor of granite setts, if the saddling were of ordinary causewaying down as far as the strand, the passage could be laid with setts, thus reducing the cost at least one half. Failing both these, the next best is to lay the saddling with causeway up to the strand, finishing up with a row of granite setts, then forming the strand and passage with concrete.

If a still cheaper floor is desired, then just lay the whole floor with causeway and at the strand put a row of kerb, or hollow the causeway to suit the fall of the floor.

It is not desirable to have a drain inside a stable if it can be avoided at all. The best plan is to lay the strand at such a gradient that if the urine cannot be got directly outside, it has only to pass through a few yards of piping to be discharged outside the wall, and this, with a little management, can usually be arranged.

The prices of the different floors are as follows: Granite setts throughout, 7s. 6d. per yard, or £4, 10s. per stall; with causeway saddling and granite passage, £2, 3s. per stall; with cement passage and causeway saddling, 18s. 6d. per stall; causeway throughout, 8s. per stall.

Before floors of any kind are laid in a steading, the farmer should see that the foundations are solid and well packed; the holes which one often sees in a stable are usually the result of a soft foundation. An easy and convenient way to make sure of proper solidity is to put a couple of men with a pair of horses each into the floor of the building to tramp it firmly down before any impediment is placed in the way. This method has been found to be a most efficient way of firming up the floor.

These remarks are equally applicable to the floors of byres.

The materials with which the floors may be laid differ, but it is generally believed that causeway saddling is the most satisfactory for all kinds of byres, except those for dairy cows, which, for cleanliness, should have floors of cement. That all passages in byres should be of cement is generally taken for granted.

Before leaving the question of floors, it may be remarked that base-stones in both stable and byres should be raised above the level of the floors from 6 to 9 inches, to prevent the rotting of the post at the foot, and the stones should all be checked to receive a mortice in the bottom of the post.

### *Cement.*

The important part which cement now plays in the steading buildings deserves a few remarks.

In laying cement floors, the first thing for the farmer, or person in charge, to see to, is to find out how many square yards of concrete are to be laid, then to make sure that for every 30 square yards a ton of cement is laid down. Many cheap and spurious brands of cement are on the market, it is therefore necessary that a good and well-known brand should be specified and adhered to. No amount of bad cement can make up for the necessary quantity of a well proved and tested brand. Besides using the requisite quantity of cement, it is also necessary, if good results are to be obtained, that great care should be taken with the mixing of the various ingredients which go to make up the concrete. The sand and cement should be mixed dry, until the mixture shows a uniform colour; add this to the shingle, broken stones or brick chips (if brick chips are used they should be thoroughly soaked in water before coming in contact with the other ingredients, otherwise they absorb the moisture before the cement has a chance of mixing), then sprinkle all over with a spray of pure water, and keep mixing until every particle of the composition has been damped. Use too much water rather than too little. The

sand must be sharp and clean, and free from earthy or vegetable matter, and if such cannot be had, then the sand should be washed clean until the water running from it is perfectly clear.

Cement should be used as quickly as possible after mixing, and accordingly only small quantities should be mixed at a time. It is a mistake often made to suppose that when concrete shows no perceptible sign of setting or hardening for some time after laying that the cement is of inferior quality, for, as a rule, it may be safely assumed that quite the contrary is the fact. Good Portland cement should be slow in setting, and when mixed with water the colour should be a bluish grey.

The concrete once laid should not be disturbed, and if the weather is very dry the concrete will get thirsty and will require to be sprinkled over a few times before setting. When in this condition it will take on a pale colour, and immediately when watered return to its bluish grey.

### *Slating.*

If Welsh slates are used, the most satisfactory size for farm building is 16 by 8 inches, or 14 by 10 inches. They should be put on with at least  $2\frac{1}{2}$  inches of cover, that is, 16 by 8 inches slates should show only  $6\frac{1}{4}$  inches on the surface, and should be double-nailed with galvanised slate nails to prevent rust. The rusting of slate nails is the first sign of decay in a roof.

### *Internal Fittings of Stable.*

With the roofs on and the cement floors laid, the joiner should now proceed with the finishing of the stable. It is of first importance that the stable should be ready for the horses before harvest if possible. As far as the construction of the interior goes little can be said, further than to see that everything is of the most substantial description: heel-posts of larch, if possible; the manger-rail should always be of hard wood—ash, oak, or beech; fire-clay manger for corn, and iron ring for water-pail. The travis boarding should never be less than  $1\frac{3}{4}$  inch thick, and either tongued and grooved or iron dowed. Strong shoulder-plates should be put on either side of each travis, as well as angle-pieces; these help to keep the travis firm should the horses be restive. The saddle-rests and harness-pegs should all be of hard wood, strongly and firmly fixed to the walls; corn-chests of sufficient capacity should be fitted up in the most convenient places.

*Byre Fittings.*

Having the stable ready for its occupants, the byre should now be tackled. Here, again, the principal thing is to see that the travises and the haiks are substantially fitted up. I often find great difficulty in getting the joiner to nail the haik-splits firm enough. Now this is most essential, especially where there are horned cattle. Then, if a good watch is not kept, you will find that the fore-stall has been joined right in the middle of the stall; this, again, is a serious mistake, for in a year or two it is sure to give way. All joinings should be made at the travis and nowhere else. The partitions in the passages of byres do not as a rule require to go farther than the wall-head. At the turnip-shed end, however, it is necessary that they should go all the way up to the roof and ridge, otherwise the ventilating system of the byre would be interfered with.

*Doors.*

Coming to the doors of the steading, I always insist on having the rolling doors run on the inside if possible. They are less apt to decay from exposure to the weather, and they have not the same chance of being badly used by the reckless handling of farm implements. Moreover, when hung on the inside, they can be boxed up strongly and cheaply with rough boarding. See that all the mountings of doors are strong and smithy-made as far as possible.

*Painting.*

This very important part in the building of a farm steading often gets little attention, although nothing in its outward finishing is of more significance.

All the outside woodwork should get three coats of best oil-paint in the first year, and if it gets another coat the next year or the one following, it should do very well for painting for ten years. But the older the steading gets the oftener it requires to be painted.

## VENTILATION OF THE STEADING.

The ventilation of the byres, stables, &c., is yearly receiving more attention, and properly so, for nothing is of more importance to the health and general wellbeing of live-stock.

The aim of ventilation is twofold—to get rid of the impure air which invariably arises, and to substitute as pure air as can

be obtained. No system of ventilation can therefore be considered adequate unless it serves both these purposes.

The exposure of the buildings must be first considered. A building set well up to the wind should require fewer inlets and outlets than one sheltered by trees or other natural surroundings, or it may be by other buildings. In the latter case, the side which is to the open will require fewer inlets than the other. However, even in the worst constructed steadings the process of ventilation is never altogether in abeyance. The working of the ordinary laws of nature help in every way the various means of ventilation employed.

Whatever the plan of fresh-air inlet employed it should be as simple as possible, either perforated bricks, metal gratings, or simply a pipe, with an upward tilt, inserted in the wall. Of these openings there should be at least one to every stall, placed slightly above the level of the animals' heads. In cases where there is a middle or dividing wall, the simplest plan is to run a pipe the whole length of the wall, with branches off to the inside where necessary. This plan might also be adopted where the outside wall is very much exposed, thus preventing the current of cold air entering too suddenly and causing undesirable draughts.

It is needless to add that, whatever the style of inlet, it should be self-acting. Many and ingenious are the contrivances which have been invented for the purpose of ventilation, but which, not being automatic, have failed through neglect or improper handling to answer the purpose for which they were intended.

It may be mentioned here that the greatest care should be

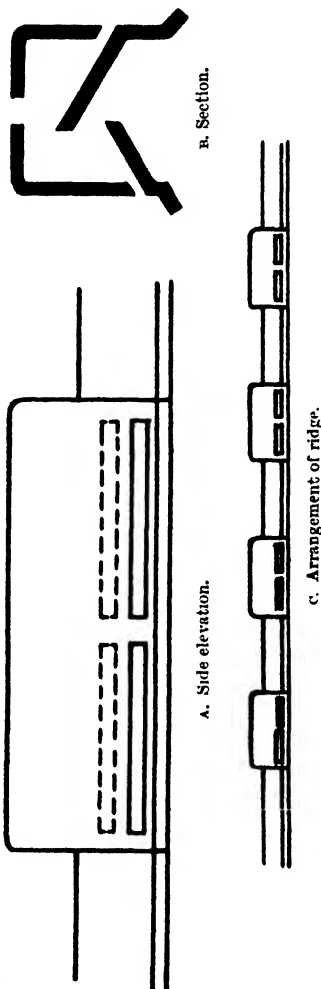


Fig. 6.—Beattie's Patent "Swift" ventilator.

taken to keep the air-inlet clean, and prevent any impediment getting in the way and obstructing the free passage of pure air. The same, of course, applies to the outlets, which have, in many cases, been found stuffed with straw, &c., no doubt with the best intentions, but quite wrong so far as the ventilation of the building is concerned.

The ridge ventilator for the outlet of impure air should also be automatic, for the reason given above. The kind of ventilator used must be in conformity with the other roofing materials or ridging—that is to say, should the ridging be of lead, the ventilator must also be of that material, while, should it be of zinc,

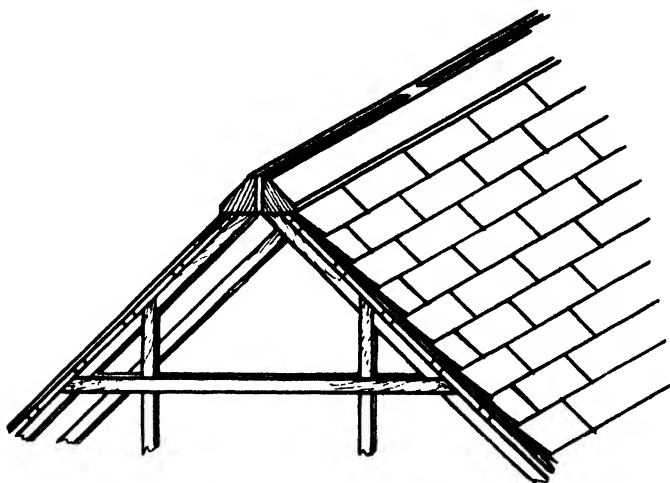


Fig. 7.—Open ridge ventilation.

the ventilator must correspond. The most common ridging for steadings, however, is of fireclay or brick.

Fig. 6 shows a section of a fireclay ventilator, named "Beattie's Patent Swift," which provides a free outlet for the bad air, while effectually excluding snow or rain, the latter precaution naturally being of the utmost importance. This ventilator is made in 2-feet lengths, and is therefore well adapted for use on ridges alternately with a plain ridge-stone between, or with two or more ridge-stones between, as may be considered necessary.

For the better diffusion of fresh air and the prevention of draughts, care should be taken that the side fresh-air inlet and the ridge ventilator are not directly in line. Should it be found that the number of ventilators are insufficient, additional ventilation may be got by the discriminate opening of one or more of the roof lights.

What is known as the open-ridge ventilation is worth noticing. It is very suitable (although seldom used) for buildings situated on low-lying ground, or otherwise very much sheltered.

Fig. 7 shows the construction of the roof, which differs from the ordinary double-byre roof, inasmuch as the only couples are principal rafters with a strong tie-beam, and the Travis-posts continued up to the rafters in the form of queen-posts. Purlins are then put on at about  $2\frac{1}{2}$  feet apart, and the sarking put on longitudinally instead of across. Care must be taken that the size of the slates is such that nails do not come in at the joints of the sarking.

The ridge is formed entirely of concrete, and is made as follows: frame up the underside close up to the sarking to receive the concrete, inserting in the middle of the ridge a board 8 inches by  $1\frac{1}{2}$  inch, or 8 inches by 1 inch—this forms the open space. The concrete is then formed along the ridge as shown, and the board removed when the concrete has set,—thus forming an open space the size of the board. The part of the apex of the principal couples is, of course, covered over with the concrete about a foot in length—this, then, leaves a clear space of 7 feet in an 8-foot stall.

#### FARM COTTAGES.

With regard to the question of labourers' cottages or cottar houses in the equipment of a farm, each individual case must be considered by itself. The size of the farm is no guide to its requirements in this respect. It all depends on the method of farming adopted by the respective farmers, the class of people employed as labourers, whether the farm is near or far from a populace centre, and also whether the wages of single men or of married men may be the cheaper in the district.

Figures 8 and 9 show the elevation and ground plan of a double cottage which, after many alterations and amendments, the writer considers the best design of such a house, and most suitable for the occupants. Each house consists of kitchen, scullery, room, and bed-closet—the scullery being frequently used as a bedroom, for which it is of sufficient size. The outside walls are of stone and lime, with slated roofs.

The interior is lined throughout with  $\frac{1}{2}$ -inch linings, the inside partitions being lined on each side, which means that the whole of the structure inside is of wood, and this is all stained (light) and varnished two coats. The question of cost between plastering the inside of the cottage or lining it is not worth considering, as both cost practically the same, but from an economical point of view the wooden finishing is by far the better.

Farm labourers shift a good deal, and the cottage is their

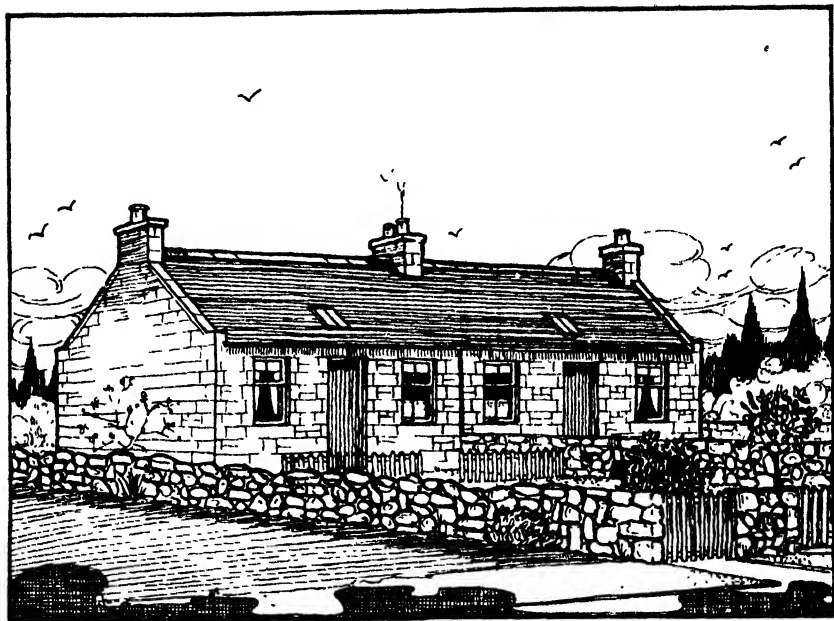


Fig. 8.—Double cottage.

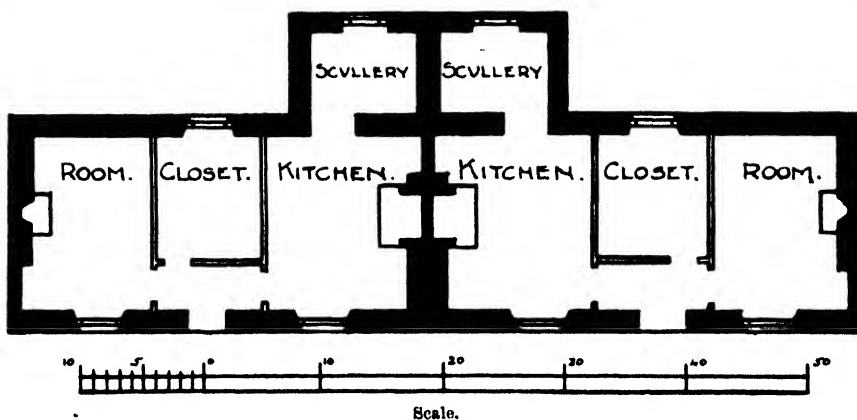


Fig. 9.—Ground plan of double cottage.

home only for the time being, it therefore follows that they have little interest in taking care of the structure. Plaster being so easily broken will not stand the hard usage that timber will, and as a matter of cleanliness the wood can be washed down at any time, which is very important from a sanitary point of view.

The floors of the kitchen and scullery are of cement, while those of the room and bed-closet are of wood.

Office-houses, consisting of coal and wood-shed, and W.C., with ashpit, are also provided. These consist of a foundation and floor of cement, with construction of wood with corrugated-iron roof.

The cost of the double cottage, with office-houses, is about £200. A single cottage, built on the same plan, would cost £105.

### WATER-SUPPLY FOR FARMS.

If no satisfactory supply already exists, the first thing to do is to look to the lie of the land, water-sheds, and so on. No one thinks nowadays of sinking wells except in very exceptional circumstances, and for special purposes; but, at least, four other methods of supplying water are largely used.

The first to be considered is, of course, the gravitation supply. This, for its simplicity, and, as a rule, for its cheapness, commends itself to every one, and even although the initial cost may exceed that of a nearer-hand scheme with mechanical means, it will for certain turn out the cheapest in the long-run. Unless farm buildings are quite on the top of a hill, one should never despair of getting a gravitation supply, until the ground has been prospected and levelled. To the naked eye levels are very deceptive and apt to give trouble unless known for a certainty.

After conclusive proof that a gravitation supply is out of the question, there still remains three mechanical devices for providing a supply of water—the hydraulic ram, the wheel and pump, and the windmill. In considering any mechanical means of supply it is well that the ground should be prospected twelve months before the water is actually required, and careful measurements taken of the proposed source.

#### *Hydraulic Ram.*

The first point to ascertain for a ram is whether there is a stream of water on the land which would answer the purpose. A well without an overflow is of no use for working a ram. There must be a stream of flowing water, no matter how small. It may be from the fountainhead of a spring, or it may be from gathered water where plenty of working fall can be had. A flow of even a few gallons per minute will do the work of a ram for small supplies, but I should not advise any one to think of a ram supply unless at its lowest the flow is 5 gallons per minute.

Wherever there is an old water-course or a small rumbling

burn with plenty of fall, you may be quite sure that you are safe in planting down your ram near by. Gravitation brings it about that water will find its way to the lowest points on the earth's surface, and the old water-runs are the surest guide we have in this direction.

The next point to ascertain is to what height and distance you wish to raise the water. The horizontal distance is of no consequence to the practicability of the scheme, but only to the expense of carrying it out, because rams can be made to force a distance of 5 miles as easily as a distance of 50 yards, provided the vertical height to which the water has to be raised is the same. But the vertical height to which the water has to be raised has everything to do with the practicability, because the greater the height the more powerful is the ram required to be, as less water can be raised out of a given quantity of driving water.

The next question, and it is generally the most important one of all, is how much working fall can you get? Now, in a case of undulating ground, this is never a serious difficulty, but on flat land, where the springs will probably be small and sluggish, it is a serious difficulty, and many ways and means will be required to have a satisfactory arrangement worked out. Can sufficient fall be got anywhere near, it may be 1, 2, 3, 4, or 500 yards away? The cost of conveying the water even the 500 yards is comparatively small, for it can be done in ordinary clay pipes, at 55s. per 100 yards, with 4-inch pipe.

Another point is, What is the least number of gallons per day that the ram is required to raise? Rams are made in any size to raise any quantity of water from 50 gallons a-day to 500,000 gallons. But a ram that is given out to raise a certain quantity of water can, in a few minutes, be made to raise half that quantity, or even less, by simply adjusting the dash-valve.

Any working fall from 18 inches up to 100 feet will do to work a ram, but the more working fall obtained up to about one-half of the total height the water has to be raised above the ram, the less the ram will cost to raise the given quantity of water, and the less driving water will be required to lift that quantity.

A word about the quality of the water. If there is any hardness or traces of iron-ore in the water, difficulty will be here experienced, because if the smallest piece of iron-ore is allowed to get encrusted on the pipes, &c., and this allowed to flow through the ram into the dash-valve, it is almost sure to adhere to the edge, and thereby stops the valve from getting close down, and allows the air to get in, and the ram stops. If this once starts it will continue at intervals as long as the iron-ore gets encrusted.

This may be stopped, however, by putting in a small filter

before the water enters the driving-tank, the filter to be composed of about 6 inches of shingle, with fine sand on the top.

One more word about rams. The person in charge should thoroughly understand the working of the dash-valve, as ignorant handling is apt to put the ram out of order. A cistern has, of course, to be provided of sufficient capacity, and at an elevation to allow the objective to have the water at sufficient pressure for all needs.

### *Wheel and Pump.*

Another way of raising the water is by the wheel-and-pump method, which means that a small bucket-wheel drives a pump of either vertical or horizontal action. This course is only usual where a small spring of good water is found in proximity to a ditch or burn, with sufficient water to drive the wheel. The water is then pumped to an elevation of sufficient height into a cistern with a capacity of 500 gallons upwards.

Only a very small supply of driving water is required. Supposing the wheel to be 5 feet in diameter and 10 inches broad, then water that would fill a 4-inch pipe will drive the wheel continually, and will be found sufficient to supply a farm up to 200 acres, provided always that the storage cistern is large enough. A double-action ram can also be put in place of a wheel-and-pump, but for simplicity and moderate cost the wheel-and-pump system is recommended.

### *Windmill.*

Failing all other means of raising water, there still remains the windmill to fall back upon. But this should be used only as a last resort, partly because it costs much more than any other scheme, and partly also because it requires a good deal more attention than the average farmer is willing to give.

The windmill must be regularly oiled, once a week at least, and requires to be uncoupled if there is any appearance of a rough night, or if a gale is actually blowing, and careful consideration has to be given to the storage.

The usual plan is to pump the water to sufficient elevation above the objective and then run it back by gravitation, and when taken into consideration that a few days' supply is, owing to the quietness of the weather and want of wind, sometimes necessary, the storage should be on the abundant rather than on the small side. To save the gearing of the mill, an indicator is usually placed on the cistern, consisting of a ball-cock with a rod and spear arrangement, which rises and falls according

to the contents of the cistern. Therefore, if the gearing is to be saved, the mill should be uncoupled whenever the cistern is full.

A thorough investigation of other means should, however, be made before fixing on a windmill. If a gravitation supply should cost even a half more, it is cheaper in the long-run.

## TYPICAL FARMS IN THE WEST OF SCOTLAND.

By ARCHIBALD MACNEILAGE, Editor, 'The Scottish Farmer.'

THE county of Dumbarton presents a considerable diversity of agricultural practice. This is chiefly due to the diversity of soil to be found in the county. Along the shores of the Firth of Clyde and in the Clyde valley there is much free "potato land," but in the back-lying portions of the county the soil is more like that to be found in North Ayrshire. Consequently in the former localities farming of an intensive character is prosecuted alongside dairying, while in the latter the practice which prevails in North Ayrshire is very much followed. The Ayrshire cow alone makes the land in these parts arable. Were it not for her peculiar merits and the revenue that may be derived from the milk trade, these higher and more backward lands, like much in North Ayrshire, would be in a state of nature. Dairy farming, through the thrifty character of the Ayrshire, is the sheet-anchor of the agriculture of the west of Scotland. It is not farming on this class of land that we now propose to describe, but farming in Dumbartonshire, where the soil is kindly and the leading characteristics are potato-growing and dairying.

### KESSINGTON.

This farm is situated in the parish of New or East Kilpatrick, close to the suburb of Glasgow known as Bearsden. It lies midway between Maryhill and that suburb, is on the estate of Rev. J. R. Campbell Colquhoun of Killermont and Garscadden, and is tenanted by Mr John Wallace, jun., the third generation of a very capable farming stock who have occupied land in that locality. Kessington extends to 210 imperial acres, of which 135 acres are arable and the remainder pasture. The whole is ploughable land, and, in accordance with a custom not unusual in the district, is wrought upon the principles of sound husbandry, without particular restriction as to rotation.

Pasture comes in the ordinary rotation, and there is no old pasture which is never broken. The soil is a light loam, or what is familiarly known as "potato land."

Drains are in good order, new drains having been laid during the past few years between the old drains in places where the subsoil is stiff. These old drains were put in under the Government drainage scheme fifty years ago. They were put down 3 feet 6 inches and 8 yards apart. The new drains have been put down 2 feet 6 inches, and the cost has been about 3s. 9d. per rood of 36 yards. The landlord provided the tiles and the tenant made the drains. Generally land drained under the Government scheme is now in need of being redrained.

The buildings are generally made to serve the purpose intended, but were a new steading built in accordance with modern requirements no doubt there would be considerable alterations. Fences, originally of thorn hedges, have to be kept in order by the tenant, and where thin are made sufficient by the addition of wire.

### *Cropping.*

The economy of the farm is made subservient to the interests of the dairy. The usual rotation of crops is oats, potatoes or turnips, wheat, and hay. Sometimes two crops of potatoes are taken in succession without an oat crop, the land being broken out of lea for potatoes. Oats are sown, in the proportion of  $3\frac{1}{2}$  bushels per acre, with the corn-drill. Wheat is usually English seed, and is sown in the same proportion. Swedes are sown 5 lb. to the acre, and yellow turnips 3 lb. to the acre. Cabbages are planted to the number of 10,000 "late" plants to the acre.

Seed for all crops is changed every year. Wheat, as has been said, is got from England, oats are from East Lothian, and potatoes from Perth or Forfar.

The lea land is ploughed 10 inches wide by 5 inches deep with a Ransome plough. One inch is taken off by the scarifier and thrown into the bottom. Seed is sown with the drill. The stubble is ploughed immediately after the harvest; then later it gets a turn of the "cultivator," is harrowed, and drilled for potatoes.

Like all farmers in the neighbourhood of Glasgow, Mr Wallace manures heavily, and is a firm believer in the merits of horse and cow dung. These are mixed and applied to the extent of from 30 to 40 tons per acre for potatoes or other green crop. Farmyard manure is applied in autumn if the land be clean; if otherwise, it is applied in the drill in spring. Artificial manures are used sparingly when plenty of dung can

be got. A little potash and superphosphate to the extent of about 2 cwt. per acre is applied to some of the oats. Potatoes will get about 3 cwt. superphosphate, 1 cwt. potash, and about  $\frac{1}{2}$  cwt. of ammonia per acre in the drills, when the dung has been applied in autumn, but no artificials are applied to the green crop when dung is put in the drills. The hay crop gets a dressing in spring of about 2 cwt. guano and nitrate of soda mixed. Basic slag is of no use on the soil of this farm, but kainit makes a decided impression, while sulphate of potash increases the size of the potatoes.

### *Varieties Grown.*

The varieties of oats sown in 1905 were Potato, Storm King, and Longhoughton. These covered about 30 acres. A timothy meadow of about 16 acres lasts from five to eight years. It gets, every alternate year, moss-litter dung to the amount of 2 tons per acre, and in the alternate year about 2 cwt. nitrate of soda per acre. Hay harvest, in a normal year, begins about the end of June, and oat harvest about the end of August or beginning of September.

Potatoes for the medium and later markets are grown to the extent of about 40 acres. British Queen, Up-to-Dates, and Langworthy are the three varieties favoured. The drills are 27 inches wide, and the sets are planted 12 to 15 inches apart. Good-sized seconds are preferred for seed, and are usually "boxed." About 3 stones (14 lb.) are put into each box, and if late are stored in the byre, or wherever there is heat. The usual process of harrowing down the drills, cultivating between the same, and setting up before the plants come through, is followed. Then the potatoes are hoed and grubbed, and finally set up. British Queens are lifted in September and the other varieties in October.

In preparing land for the turnip crop the process up to a point is the same as for potatoes. The varieties sown are Best of All swedes and Aberdeen yellows. The ground receives an application of from 3 to 4 tons ground gas-lime in spring before being cultivated. This is a preventive of finger- and - toe. Thereafter it is harrowed and drilled, to receive the manure and the seed. Swedes in a normal season should yield about 30 tons and yellows about 35 tons per acre.

Potatoes are stored in pits containing from 6 to 8 cwt. per yard. Swedes are also stored in pits to the extent of 1 ton per yard. Yellows are placed in flat heaps.

Cabbages are only grown to the extent of about 3 acres for the cattle. They get plenty of dung, and about 3 cwt. nitrate of soda at the roots.

*Dairying.*

A stock of 65 milk cows is carried. They are chiefly Ayrshires and Shorthorn crosses. They are kept in constant milk all the year round, and consequently are not a breeding but a "flying" stock. Sweet- or whole-milk is delivered to the shops every morning, at a regular fixed price on a twelve month's contract. "103," as it is termed, was the price for the twelve months, not on this farm alone, but generally in the neighbourhood in 1905.

*Labour.*

This, on a farm conducted as is Kessington, is a heavy item. There are three married ploughmen, each of whom gets about 22s. per week and perquisites, which include a free house; two labourers, whose wages run to about the same figure; two dairy-maids at £12, 10s. and £8 respectively per half-year; one byreman at £14 per half-year with his board; and one married byreman at the same wages as a ploughman. Women workers are available when required for sowing, planting, weeding, or harvesting, at 2s. per day. Mr Wallace has not yet introduced the milking-machine, as he is able to obtain sufficiency of milkers. He is always on the outlook for labour-saving implements, and keeps himself abreast of the improvements in agricultural machinery.

## CLACHAN FARM, ROSNEATH.

The peninsula of Rosneath is bounded by Loch Long, the Firth of Clyde, and the Gareloch, and attached to the mainland by an isthmus of not much more than a mile broad, between Gareloch-head and Portincaple on Loch Long. The greater portion of the peninsula has been in possession of the Duke of Argyll and his ancestors from about the close of the fifteenth century. On account of this, and the proximity of the peninsula to Argyllshire, many, including Sir Walter Scott, have made the mistake of placing Rosneath in the great western county. In the beginning of the nineteenth century, and up to the death of Mr Lorne Campbell in 1861, the Chamberlain of Argyll resided in Rosneath, and drove the long distance to Inverary as occasion required. The Home Farm of Rosneath, which stretches along the Firth from the Gareloch almost to Kilcreggan pier, was occupied by Mr Campbell, who was one of the most advanced agriculturists of his day. The Clachan farm, lying on the shores of the Gareloch, and embracing some hill land also, was occupied by Mr John Campbell, the laird of the small estate of Peaton, on the Loch Long side of the peninsula. He re-

linquished the tenancy about the year 1869, after which date the farm was occupied until 1908 by the late Mr Matthew Howie.

The fame of Mr Howie as an improver of land has travelled far. His eldest son, Mr Robert Howie, has for about twenty years occupied the farm of Drumfork, on the Helensburgh side of the Gareloch; and a younger son, Mr Matthew Howie, jun., has almost completed a ten years' lease of the Rosneath Home Farm. All three farms are wrought with special regard to the potato trade and dairying. The land on the Rosneath farms, especially along the shores of the loch and the firth, is well adapted for this purpose. The rural economy practised on the Clachan farm conveys a good idea of the general system of management on farms of this class.

### *General Description.*

Clachan farm extends to about 200 acres, of which 80 are arable, 60 are pasture, and 60 rough moorland. Along the shore the soil is a nice sandy loam; a little farther back and higher up it becomes more gravelly, and the hilly land is of a lightish clay. The drains are kept in good order, and the whole farm is well drained. New drains are cut as required when working the land.

In recent draining the tenant defrayed the cost of digging and filling in, on the arable land, the landlord supplying the tiles. The drains are, as a rule, placed 15 feet apart, and from 2 to 4 feet deep, according to the fall of the surface.

A novelty on the farm is the structure of the steading. The old steading was placed at the extreme north end of the farm, beside the famous yew-tree avenue. It was badly planted, and a new steading was erected about twenty years ago on what is called the Hill of Campsail, almost in the centre of the farm, and on a site which commands a beautiful view of the Gareloch. For economy in labour the buildings are all under one roof, the centre being an open shed and the east side the byre. The wall of the byre to the inside is only built half-way up for ventilation purposes. The stable and barn are on the west side of the building, and the whole is wonderfully compact and wholesome. The chief drawback to a steading of this kind is the risk of fire, and there is also trouble should infectious disease unhappily break out. The dwelling-house is to the front, facing the loch.

Fences are of three kinds: (1) stob and wire; (2) hawthorn, beech, and other hedges; (3) stone dykes, some with and others without wire fencing on top. The first are in need of renewing, but the second and third are in fairly good order.

*Cropping.*

As has been indicated, the leading features of the farm are dairying and the growth of early potatoes. The latter will come about a fortnight later than those from the earliest farms on the Girvan shore. The rotation followed is: (1) oats, (2) roots, (3) oats, (4) seeds, (5) pasture. This is the usual rotation in the district, but sometimes a potato crop has been taken immediately after lea, the turf being buried in the bottom of the furrow and the soil turned over by a second plough.

Seed oats from the north of Scotland are preferred. They are sown to the proportion of 4-5 bushels per acre according to variety. Hamilton and Banner oats have in recent years been favoured.

Roots are sown to the extent of 2 to 4 lb. per acre. If the variety be yellow turnips about 2 lb. will do, but 4 lb. of swedes will be used. Aberdeen green-top yellow turnips (Drummond's), Sutton's "Magnum Bonum," and Garton's "Model" swede have recently been in favour. Cabbages are planted to the number of 10,000 to 16,000 plants per acre. These are grown solely for feeding purposes in the dairy.

The stubble land is ploughed immediately after harvest should the weather be dry. Farmyard manure is applied in autumn if the weather be favourable and the other departments of labour admit of this being attended to. Mr Howie was a liberal feeder of the soil. During the earlier years of his occupancy of the farm he applied heavy dressings of town manure and gas-lime where such would be beneficial. He was liberal in the application of sulphate of ammonia, muriate of potash, pure dissolved bones, and superphosphate, with bone-meal or steamed bone-flour, as a drier. The proportions vary according to the crop. Potash forms an ingredient in every application except on very heavy land. Basic slag has not been tried, and, judging by experience elsewhere, it would not be of much use on the free gravelly soil of Clachan farm.

*Growth of Timothy.*

About one-tenth of the acreage is put under timothy hay. A meadow lasts about three years, after which time it is apt to become choked with weeds, such as *Holcus lanatus*, and goose-grass. In preparing the soil for a timothy meadow the following procedure is observed: It is sown out after early potatoes, with a dressing of 3 cwt. per acre mixed artificial manures, and this quantity is applied every spring until the meadow is again broken up.

In a normal season hay harvest will begin in the last week

of June or first week of July, and oat harvest in the first or second week of September.

Clachan farm is very sheltered, consequently it is perhaps one of the worst drying farms in the west of Scotland.

Potatoes are grown to the extent of about one-seventh of the total acreage. Epicures are grown for the greater part. The drills are drawn from 26 to 28 inches apart, and the sets are planted from 12 to 14 inches apart. The seed for all kinds is "boxed." The potatoes intended for seed, at digging-time in July, are dressed over a  $1\frac{1}{2}$ - to  $1\frac{1}{2}$ -inch riddle. They are barrelled, carted home, and emptied into the flat shallow boxes. Each of these contains from 2 to  $2\frac{1}{2}$  stones of potatoes. They are stored in lofts, and built up in tiers, one on the top of the other, protected from frost. They are left thus until seed-time, when they are brought out and planted sprouted. Without this boxing system Scottish potato-growers could not now compete with foreign growers in the early markets. After being planted and covered, the drills are saddle-harrowed, and then set up again until the plants begin to show above ground. They are then hoed, grubbed, and ploughed up again; if of the medium varieties, they are finally sprayed for the prevention of disease. The digging season usually begins about the first week of July and continues, off and on, until about the end of August. Greenock is the market for potatoes from the Rosneath and Helensburgh early farms.

In working the land for turnips and cabbages, it is first ploughed, then "cultivated" across, ploughed again, harrowed, and drilled up. If with this the tilth is not fine enough, the drills are saddle-harrowed and set up again, after which the seed is sown or cabbage plants planted. Yellow turnips yield from 40 to 50 tons per acre, swedes from 20 to 30 tons per acre.

Cabbages are treated with chemical manures twice or thrice during the season.

### *Dairying.*

The dairy consists of 30 Ayrshire milch cows. It is self-contained—that is to say, calves are reared to keep up the numbers, so that as a whole the farm carries a stock of about 70 head of cattle. Calves get whole-milk for about three weeks after birth; thereafter from three to six weeks they get skimmed milk; then the best grass on the farm until wintering begins. All turnips are lifted and stored in shed. One-half the swedes are carted home and stored in covered heaps in the yard; the other half are heaped in the field and covered lightly with soil from 4 to 6 inches deep. By this means stores for wintering are always at hand.

The milk is sold retail in the district at an overhead price

of about 1s. per gallon. Of course it is largely a summer trade, and this suits well the system of stock-rearing pursued—most of the cows going dry in winter and calving again early in spring. Butter is made once or twice a-week and sold retail along with fresh milk. The price of butter will run from 1s. 4d. to 1s. 6d. per lb.

### *Labour.*

Two ploughmen are kept constantly employed at from 20s. to 21s. per week, with free house or bothy. Ordinary labourers and women workers vary in number. Three will be the normal staff, but during the busy seasons as high as eight will find plenty to do. Women's wages run from £11 to £12 per half-year, with board and lodgings.

This system of dairying may be said to be universal along the west coast in the neighbourhood of watering-places, where there is a good demand for milk during the summer months. The system ceases to be profitable when the milk or other produce cannot be disposed of retail in the neighbourhood. Selling at wholesale price, with carriage by steamer or rail, or it may be both, is unprofitable. Milk is produced at too high a cost to leave a paying margin under these conditions.

### DRUMFORK, CARDROSS.

This farm is situated close to the Craigendoran station and pier of the North British Railway Company on the east side of the Gareloch, and about one mile from the town of Helensburgh. It is on the property of Mr William Middleton-Campbell of Colgrain, and extends to 194 acres arable, with 87 acres rough pasture or moorland. The soil is a light loam, with patches of sand and thin moss and sand mixed. A considerable extent of the farm was redrained during 1900-1903, about 5 acres being dealt with each year. The drains were dug from 30 to 36 inches deep, and laid with 3-inch tiles. The cost of opening, laying tiles, and filling in was 3s. per chain of 22 yards. Much redraining is required in Dumbartonshire, especially where tile drains have crossed old stone drains. Wet places in such cases are numerous, and a redraining scheme would help agriculture. The fences on Drumfork are in excellent order: they consist of thorn-hedges planted in a wire fence. This makes a most effective fence.

### *Cropping.*

The leading feature on the farm is the growing of early potatoes. There is no fixed rotation. Oats are grown to the

extent of about 12 per cent of the whole acreage, and the seed is sown to the amount of about 5 bushels per acre. Oat seed is procured from the Lothians, and Mr Howie gives the new varieties a fair trial.

Seeing that the leading feature is the growing of early potatoes, lea land is ploughed with a skim coulter, one-way plough, from 1st December onwards. The dung is first applied, or is applied as the ploughing proceeds. Stubble land is treated in the usual way. Liberal dressings of stable and bullock dung are applied in autumn, the quantity varying from 20 to 30 tons per acre. Artificial manures are also applied in various mixtures according to the crop. Potassic manures are found to be of marked benefit to the potato crop. The residue from the application to this crop no doubt favourably affects the subsequent crop.

In laying down a timothy meadow for three or four years the same course is followed as has been described in connection with Clachan farm; but in the succeeding years the application is from 10 to 15 tons of farmyard manure in the autumn of one year, alternating with artificial manure in the spring of the next.

Drumfork is earlier than Rosneath. The hay harvest usually begins from 20th June to 1st July, and oat harvest in a normal season from the middle of August to 1st September.

### *Green Cropping.*

To this department Mr Howie devotes close attention. As a rule, about 80 per cent of the green crop break of the farm is annually under potatoes grown for the "early" market, Epicures being now the only variety grown. The drills are 26 inches wide, and sets are planted 10 inches apart. The system of "boxing" is, of course, followed very much as described in other portions of this paper. Potatoes of size for seed are either put right away into boxes at digging-time, or are laid down in small pits covered with straw, to be dressed up and boxed in harvest. Early potatoes are dug in July and marketed forthwith.

Best of All swedes are sown after the land has been thoroughly wrought and cleaned. It is dunged in autumn on the stubble, and ploughed, harrowed, and drilled in spring, and the seed sown with artificial manure in May. Generally the yield will be from 25 to 35 tons per acre. In lifting these roots, part are stored in sheds, part in the stackyard, and part in small pits in the fields.

Cabbages are grown to supply the local market. The land is dunged on top of ploughing, and drilled up; planting thereafter takes place. About 1 acre of carrots is grown for the

local market. Rape is sown on one-third of the potato land after the crop is lifted, and sheep fed thereon in autumn. The remaining two-thirds of the potato land are sown out with grasses for either one year's hay or for one year's hay and temporary pasture.

### *Live Stock.*

A stock of from 50 to 60 Ayrshires is carried. Calves are bred and reared. They get whole-milk for the first six weeks of their lives; thereafter skim-milk and oilcake-meal for about the space of other six weeks, with cut turnips and straw in winter and grass in summer.

With the exception of what is consumed by the calves, all the milk is churned. Buttermilk is sold in Helensburgh at about 10 gills for a penny. Fresh butter, which is of the choicest quality, realises about 1s. 6d. per lb. retail. This trade requires about one-half the time of a man and horse.

About five score Blackface ewes are brought in each year. They begin to lamb in March, and the lambs are sold off as soon as they can be made fat enough for the butcher. About seven and a half score cross-bred lambs are bought in autumn, and, along with what remains of the home-bred cross lambs, eat up the foggage and rape sown after potatoes. The ewes which have borne the lambs are also fattened off, and the aim is to have all this flying stock cleared off the land before the 31st December.

### *Labour and Implements.*

The servants stately employed on Drumfork are two ploughmen, a milkman, one shepherd, and a byreman. During winter an extra or "orra" man suffices, but in summer as many as five such men may be employed. The number of women workers also varies.

The regular men's wages run from 21s. a-week, with free house and garden. Labourers get 20s. a-week and bothy accommodation while employed. Women get from 2s. to 2s. 3d. per day in the season. The wages' bill annually exceeds the rent by a considerable figure.

### *Implements.*

These are of the usual kind and class found on the more up-to-date west of Scotland farms. A novelty is a one-way digging-plough made by Messrs Davey, Sleep, & Co. It does most of the work, and is regarded as very satisfactory. On the farm there are also four ordinary zigzag harrows, three ordinary

modern cultivators, three drill-ploughs, two mowers, one self-binder, two hay-rakes, two rick-lifters, potato-digger, one double drill and manure sower, five coup-carts, five hay-waggons, broadcast manure distributor, turnip-sower, and a great variety of other implements and utensils.

Drumfork is a farm well worth visiting. It is thoroughly up to date in every sense of the term.

### FINNICK BOG, INVERKIP.

This farm is situated in the county of Renfrew, farther down the firth than either Drumfork or Clachan, Rosneath. It lies with a western exposure on the estate of Sir Hugh Shaw-Stewart, Bart., facing the Innellan shore of Argyllshire. The occupant, in December 1905, when these notes were collected, was the late Mr Wm. Howie, a brother of the late tenant of Clachan farm, now also passed away. Like the other members of the family to which he belonged, Mr Wm. Howie was an excellent farmer; and the traditions of the house are being sustained by his widow and family, who continue to occupy the holding.

Finnick Bog consists of 220 imperial acres, of which 180 are arable and 40 acres rough pasture. Near to the shore the soil is free and "earthy," good for potatoes. Towards the centre of the farm it changes and becomes rather stiff, resting on a clay bottom. On the higher levels, as the name indicates, it is sandy and mingled with moss.

#### *Draining and Fencing.*

As in almost every other case dealt with, Mr Howie commented adversely on the manner in which draining was carried out under the Government scheme about half a century ago. These have recently been lifted, or are in course of being lifted, and new drains are being put down by the proprietor, 3 feet deep, with 2½- or 3-inch tiles and 12 feet apart. This gives much better results than the Government system, which put down the drains 4 feet deep, with 1½-inch tiles and 15 feet apart. The cost of recent draining runs to about £12 per acre. Land in the neighbourhood is generally well drained and fenced.

#### *Cropping.*

The main departments prosecuted on this farm are dairying and potato-raising. The rotation is oats, green crop, oats, hay, and three years' pasture,—a very common west of Scotland

practice, and well adapted to dairying with a sweet-milk trade during summer.

The land is ploughed out of stubble with a deep furrow. The dung is spread on the top of the ploughed land for either potatoes or turnips, and ploughed or drilled in. For early potatoes, besides the dung, a dressing of about 6 cwt. superphosphate, 2 cwt. potash, and 2 cwt. ammonia is applied. Mr Howie approved of the autumn application of farmyard manure—that is, spreading the dung on the stubble.

For oats new seed was got every year from the Lothians. In recent years Hamilton and Tartar King were sown on the black land to the extent of 25 or 30 acres, and 5 bushels to the acre.

Basic slag was found useful on the rough pasture—which is what one would expect in view of the character of the soil.

A timothy meadow will last for a good many years on the heavy clay soil if it be liberally manured with town (ash) dung every second year, and dressed with about 2 cwt. nitrate of soda per acre every year.

### *Potatoes and Roots.*

From 10 to 15 acres of potatoes are grown annually for the early market if possible. The varieties planted are Epicures, Sutton's Early, Regents, Jeanie Deans, and British Queen. Boxing is, of course, followed, and Mr Howie gives the hint that the seed boxed should be free of disease. When the stems are as long as is desired, the boxes should be exposed to the air, which has the effect of hardening or toughening the stems. They should be planted as loose and as dry as possible. After planting, the usual course of working the drills is followed, the great aim being the loosening of the soil and keeping it clean and free from weeds. Digging begins early in July, and the market is chiefly Greenock, and, to some less extent, Newcastle-upon-Tyne.

Swedes are sometimes sown on land which is trenched out of lea. The crop in that case is manured with slag and potash. Generally, however, the west country practice is followed of making the green crop follow stubble. King Edward and Best of All swedes are the varieties sown, and the crop may vary about 35 tons less or more. An effort is made to store as many roots as possible in November, but sometimes a few acres are left growing until spring.

### *Stock.*

The dairy stock consists of a superior herd of about 30 Ayrshire cows. Mr Howie was a good judge of this class, and frequently officiated at shows in the west. His own herd took

prizes at Greenock and other local shows. He reared his own calves, and fed them in the manner elsewhere described. The market for milk was a retail trade in Skelmorlie, at about 1s. per imperial gallon.

### MID-ASCOG, BUTE.

This well-known farm is situated on the east side of the island of Bute, facing the North Ayrshire coast. It is on the estate of the Marquis of Bute, and tenanted by Mr Robert M'Alister, who follows his father, after whom he is named. It is one of the best farmed holdings in Bute, extending to 196½ acres. The soil varies. About one-third of it is free open soil, easily wrought, clean, and raising good crops. Another portion is medium soil, and more stiff to cultivate. A third is also rather stiff, and rests on a cold subsoil.

The land is generally fairly well drained. The drains are being gradually renewed each "break," and when put down anew are being laid 15 feet apart and 2 feet 9 inches deep. The cost is about 9d. per fall.<sup>1</sup> Buildings and fences are generally in good order. In accordance with modern ideas, there might perhaps be more hay-sheds. The leading feature on the farm is dairying, the whole economy of the holding being made subservient to the claims and success of this department.

### *Cropping.*

The rotation followed is the popular seven-course shift, to which reference has already been made—oats, green crop, oats, hay, and three years' grass. Oats are sown to the extent of 5 to 6 bushels per acre, roots at the rate of from 4 to 5 lb. per acre, and cabbages are planted 10,000 to the acre. The oats grown are usually Hamilton, the time-honoured Potato, and the popular Longhoughton. Seed is obtained from the Lothians, and is changed annually.

Ploughing stubble begins immediately after harvest, and in some cases "cultivating" is preferred on light land. Farmyard manure is applied either on the stubble or on the ploughed land at the rate of 30 to 40 "cart-loads" per acre. A "cart-load" will be about 12 cwt. Artificial manures are applied when the crop is being put in, at the rate of 6 cwt. superphosphate, 1 cwt. ammonia, and 1 cwt. potash per acre. When farmyard manure is scarce, bone-meal may be added to the application. Basic slag is applied through pasture, and has done well.

<sup>1</sup> One fall = 18·5299 feet (Scots lineal measure).

Mr M'Alister has about 8 acres under timothy hay, and finds the meadow serviceable for many years. He dresses it alternately with farmyard dung and artificials.

Mid-Ascog is not generally so well adapted for early potato-growing as the other farms described in this article. Hence the early market is only aimed at when the fields under green crop happen to be those which are likely to prove suitable. In such seasons the usual course is followed, and Epicures, Satisfaction, and Sutton's Abundance varieties are grown. The seed is planted "whole" in 26-inch drills, and from 12 to 14 inches between each set.

Purple-top yellow turnips and Bronze swedes are sown. The average yield will be about 25 tons per acre.

### *Stock.*

The standing stock of the farm is not less than 30 Ayrshire milk cows with their followers. As the records of the show-yards attest, the quality is of an exceptionally high order. Mr M'Alister inherits a love for Ayrshires from both sides of the house, and for half a century the Mid-Ascog stock has been one of the most noted in the west of Scotland. The history of the herd and its foundation was told by the writer in the 'Transactions' more than a quarter of a century ago, and need not be repeated. Occasionally a superior calf or quey may be purchased, but as a whole the stock is self-contained, being replenished from within itself, but stock-bulls are purchased or hired from time to time as opportunity offers.

The market for the produce is Rothesay and the Ascog shore, where during the summer season the milk is retailed at 1s. 4d. per imperial gallon, and butter is sold at from 1s. 2d. to 1s. 4d. per lb. A milkman and horse are every day employed in the sale and delivery of the milk and butter.

### *Labour.*

There are employed on the farm regularly two married ploughmen, who have a weekly wage and cottage accommodation; one cattleman, and two women workers.

In the main it may be said that the Mid-Ascog economy is typical of Bute agriculture. The only variation may be in the form in which dairy produce is disposed of. On farms within a five-mile radius of Rothesay or other watering-places the trade is either purely a whole-milk trade, or, as in the case described, partly whole-milk and partly butter. Beyond the five-mile radius it is wholly butter and buttermilk.

*Horse-Breeding.*

On Mid-Ascog two or three Clydesdale foals are reared annually, and throughout the island horse-breeding is generally prosecuted. The rivalry among the farmers in this department is vividly reflected at the annual shows in May and October. The "pursuit" of horse-breeding is fostered by the very liberal premium given annually by the Marquis of Bute for a Clydesdale stallion to travel in the island.

## SHIELDS, RENFREW.

The farm of Shields lies midway between the burgh of Renfrew and the burgh of Govan, on the south bank of the river Clyde. It is partly in Lanarkshire and partly in Renfrewshire, and is the property of the Clyde Trustees. The tenant is Mr Thomas Fulton, who takes a very active interest in public movements having as their goal the advancement of agriculture.

The farm extends to 160 imperial acres, of which 135 are arable and 25 pasture. One-half of the soil on the farm is good cropping land, one-fourth is moss, and the remaining one-fourth is stiff clay. Generally the farm is well drained and fenced, and the tile-drains are being renewed according as this is seen to be necessary. Drains are laid 15 feet apart, and between 3 and 4 feet deep.

*Cropping.*

The farm carries a stock of 25 Ayrshire cattle, the produce of which is sold one-half wholesale in Govan; the other half is retailed. The milk supply has to be kept up all the year round, so that there is no breeding, but cows are sold out and fresh ones bought in according as the exigencies of the trade may require. In this case the outstanding feature of the farm is the general cropping, which differs somewhat from any we have hitherto reported on.

The rotation followed is a four years' shift—wheat, hay, oats, green crop. This indicates that the dairying is akin rather to cowfeeding than to what is known as dairying proper. Wheat is sown at the rate of 3 bushels, oats 4 bushels; turnips or swedes, 5 lb. per acre; and cabbages are planted, 10,000 of Drumheads variety to the acre. Wheat seed is got from England and oats from Angus.

In preparing the land for wheat, the green crop land of the previous season is turned over with the swing-plough and twice harrowed. For oats following hay, the hay stubble is turned

over and the seed sown sometimes by hand and sometimes with the corn-drill. For green crop the oat stubble is twice ploughed, and the drills drawn with a "double-breasted" plough. Farmyard dung is applied at the rate of 30 tons per acre, and artificials at the rate of 3 cwt. per acre of combined nitrate of soda, superphosphate, and potato manure. Potassic manures have been found useful in strengthening straw, but basic slag has not proved satisfactory.

The varieties of oats sown are Potato, Black Tartarian, to the extent of about one-fifth of the whole area of the farm. Timothy hay is grown to the extent of one-fourth of the area, and a meadow will last for ten years. It is top-dressed every season with either artificial manures or farmyard manure or "short" dung. Hay harvest may begin about the first week in July, and oat harvest seldom before the first week in September.

#### *Green-Cropping.*

Potatoes occupy about one-fifth of the whole area of the farm. Mr Fulton aims at the early and the late market. He plants British Queen, Gartons, Up-to-Dates, and Langworthys. They are planted in 27-inch drills 10 inches apart. Seconds which have been boxed are planted for earlies, and "cut" sets for late varieties. The boxing is done in the usual way. The other seed is "cut" about a week before it is required for planting.

Of roots the varieties usually sown are Electric and Green-top swedes. For them the land is twice ploughed, grubbed, and drilled. The average yield per acre will be about 20 tons. About one-half the root crop is sold off the field; the other half is stored in pits for winter-feeding of cattle.

#### *Labour.*

Three ploughmen are employed in spring and autumn, and one less in summer and winter. There are, in addition, one ordinary labourer, four women workers, and one boy. The ploughmen get 21s. per week with potatoes and free houses, and the labourers 18s.

#### A HIGH-LYING COLD FARM.

We do not for one moment suggest that the farm we are now to describe is the kind of place one would care to select if he had an unrestricted choice. But it is undoubtedly a typical farm, and the manner in which it is handled has useful lessons for a wide circle of agriculturists.

The tenant worked for his father on a farm of similar soil in Dumbartonshire for a time, and was foreman on a large farm near Glasgow for seven and a half years. The farm extends to 93 imperial acres, of which 58 are arable and 35 rough pasture. The soil is mostly boulder clay, and by no means easy to keep dry or in good heart.

Draining was done fitfully in 1893, 1897, and 1898. The distance between drains is 15 feet; the mains are sunk 2 feet 9 inches, and the ordinary drains 2 feet 6 inches. The cost of draining such land varies greatly, and may be anywhere between £6 and £10 per acre. Generally the farms on the smaller estates where such soil prevails are not well drained. The housing is also indifferent, and not too well adapted for the kind of work required to be carried on on such farms in order to realise a profit.

### *Cropping.*

In cropping the class of soil prevailing on such places considerable freedom of action must be allowed. It has been found useful practice to take a green crop after lea, or occasionally to sow out after oat stubble with oats, hay, timothy hay, or pasture. In fact, the rules of good husbandry on this class of soil are the rules by means of which land can be most economically kept clean and in good heart. In one year the allocation may be something after this fashion: oats, 4 to 10 acres; black tartarian, sown at the rate of  $4\frac{1}{2}$  to 5 bushels per acre; wheat, when any, 2 to 3 acres, at the rate of 3 to 4 bushels per acre; roots, 3 acres, yellow turnips at the rate of 5 lb. per acre, and swedes at the rate of 6 lb. per acre; 1 to 2 acres cabbages—earlies planted, 12,000 to 15,000 per acre; lates, 10,000 per acre; mangels,  $\frac{1}{2}$  acre, in the rate of 8 to 12 lb. per acre.

For several years, in order to improve the land speedily, green crop was taken from lea without a corn crop.

These particulars suggest what is the fact, that a farm of this kind can be kept in cultivation only because of the merits of the Ayrshire cow and her crosses in the dairy. Her produce alone brings in revenue, and the economy of the farm is subservient to her claims for food.

In working land for green crop the cultivator is used rather than the plough. Perfect harrowing has to be done, and the clods are broken with the grubber rather than with the roller. The green crop gets from 20 to 30 tons per acre of farmyard dung, and the timothy meadow is similarly treated with 10 to 15 tons per acre every two or three years. On such soil autumn application of farmyard manure is bad practice.

Artificial manures are used in proportionately large measure. Turnips get, per acre, 8 cwt. basic slag, 4 cwt. superphosphate,

and occasionally 1 cwt. kainit or sulphate of potash. Potatoes get 4 cwt. basic slag, 2 cwt. kainit or sulphate of potash, and 2 cwt. nitrate of soda. Mangels get 4 cwt. basic slag, 4 cwt. kainit or sulphate of potash, and nitrate of soda 2 to 4 cwt. Cabbages get 4 cwt. basic slag, and 2 to 3 cwt. nitrate of soda. Hay (seeds) gets 2 cwt. basic slag, 2 cwt. kainit, and 1 cwt. nitrate of soda. Timothy gets 1 to 2 cwt. basic slag, 1 to 2 cwt. kainit or sulphate of potash, and 2 to 3 cwt. nitrate of soda.

It will be seen from these figures that this is a case in which basic slag is in favour. The tenant has used up to 6 tons per annum during the past seventeen years. By applying kainit to oats in June, when deemed necessary, lodging is prevented, and either kainit or sulphate of potash does wonders in bringing away the resultant crop of clover. In 1893 the tenant dressed his second year's hay with 1 cwt. sulphate of potash, and the crop yielded over 1 ton per acre. It was nearly all clover with hardly any ryegrass amongst it.

The practice of cultivating land without a green crop is absolutely necessary on such soil, seeing that it is badly drained. It saves the soil and the manurial residues, as well as keeps down expenses in working. The crops so grown are heavy. The main thing is to see that the land is well manured.

Timothy is grown up to about one-third of the entire acreage of the farm. A meadow will last as long as it is liberally treated. The tenant has cut his meadow for over ten years. In laying down, it is well not to overshadow the timothy with the sowing out crop. Avoid perennial ryegrass, and manure early and heavily after the seeds so as to give timothy the upper hand. Apply farmyard dung every second or third year. At intervals apply gas-lime to the extent of 4 to 6 tons per acre. If treated in this liberal fashion the timothy will crush out the softer grasses and last indefinitely.

### *Green Crop.*

In working land for green crop, the lea is ploughed with the Oliver 240 plough across the line of the drills. Thereafter it is thoroughly harrowed, drilled, and dung put into the drills. After the dung is scattered artificials are sown, and the drills are then set up with single plough with a seed-barrow attached. The root crop varies greatly—from 15 to 30 tons per acre are given as the limits.

### *Live Stock.*

This cold clay farm of 93 imperial acres carries a dairy stock of 38 head of cattle, three-fourths of them being Ayrshires and one-fourth Shorthorn Ayrshire crosses. Four to eight calves

have been reared every year to keep up the stock, and as they are designed for dairy purposes they are not allowed to get too fat, but are kept growing on naturally from the start. A Cumberland Shorthorn bull is sometimes used, and the results so far have been satisfactory. The difficulty in buying such is to know exactly the milking pedigree of the animal. If this could be relied upon the tenant thinks the system worthy of extension. The produce of the dairy is retailed in two populous places at from 11d. to 1s. per imperial gallon; and what butter is made is also sold retail to customers at 1s. 2d. to 1s. 4d. per lb. Churning is done only at holiday times. The half of one man's time is taken up daily in selling milk. The tenant retailed milk himself, with a boy, until some years ago. Retailing costs in wages from 2d. to 3d. per gallon.

### *Labour.*

It goes without saying that the heavy end of the labour on a farm of this kind falls upon the master and mistress. Besides the milkman, there are constantly employed on the farm one ploughman, at 22s. per week, with free house and potatoes, and one female servant in regular employment at £8 to £12 per half year. Additional labour is paid in spring and harvest—men at 3s. 6d. to 4s. per day, and women at 2s. per day. The total wages annually paid for several years, including perquisites and board, amounted to £250. This did not include any allowance for the labour of the master and mistress.

A small extent of hay has usually been sold, sometimes with the right to top-dress the land and take a second crop. Close on a hundred head of poultry are kept. Eggs are sold at from 1s. to 2s. 6d. per dozen, bringing in from £40 to £50 a-year.

## THE MAKING AND MARKETING OF BUTTER.

By WILLIAM SMITH, Edinburgh.

THE magnitude of the butter-making interest is greater than is generally imagined. The annual value of the milk produced in the United Kingdom is over fifty million pounds sterling, and one-third of the whole—over sixteen million pounds' worth—is used in making butter. It will no doubt be surprising to many to learn that there is more milk used in butter-making than in the sweet-milk trade, the quantities being about 622,000,000

gallons consumed as milk, 945,000,000 gallons used in the making of butter, and about 150,000,000 gallons being made into cheese.

The increase of the consumption of new milk is going up at the rate of over 6,000,000 gallons per annum, which means an increase of 10,000 cows yearly, so that dairying cannot be called a waning industry. Indeed there is evidence all over the country to-day that agriculturists are now alive to the possibilities to be derived from an extension of this branch of agriculture.

### *Scientific Knowledge Essential.*

Butter-making is an industry in which scientific knowledge is of paramount importance. The difference in value between choicest and inferior brands is sometimes as much as 50 per cent, and unfortunately in this country a large proportion of the butter made is still of an inferior kind. No doubt our dairy schools and itinerant classes are disseminating useful knowledge and demonstrating proper methods, which are bearing fruit in butter-makers producing a better article and getting higher prices. Still one weak point in connection with these classes is, the teacher has no command over the breed of the cow, the production of the milk from which the butter is produced, and it is here that the science of choicest butter-making begins.

### *Influence of Food.*

It should be known to all butter-makers that the feeding of the cows affects the quality of the butter; and where butter is made at home, without the aid of scientific appliances for counteracting the effects of feeding on the milk or cream before the butter is made, it is absolutely necessary to refrain from giving the cows raw turnips, mangolds, carrots, barley straw, fusted hay or straw, or any kind of heated fodder, or linseed-cake, as all these are detrimental to good butter-making.

The belief that you can regulate the richness of milk almost as you please by feeding has been contradicted by careful experiments which prove that the richness of milk depends more on the breed of the cow, and can only be slightly altered by the feeding; but while neither rich nor excessive feeding will continue to maintain a higher standard, it must not be supposed that poor feeding will pay. A well-nourished body is essential to the prolonged production as well as the richness of the milk, therefore it is sound practice to feed generously.

Milk is produced on a variety of circumstances according to when and how it is to be used, but where cows are kept for

butter-making, the object is not only to obtain the full quantity of butter-fat the cow can give, but to have it free from any offensive odour or flavour, and firm in texture at all seasons of the year.

**SUMMER FEEDING.**—During the grazing period, and especially in the earlier part of that season, the butter is soft, spongy, and retains a large proportion of moisture. To counteract this, the cows should only be allowed to gather part of their food from the field, and have the remainder made up of from 3 to 4 lb. of cotton-cake per day; and where pastures are rich, on highly-cultivated or naturally highly-productive land, the cows should have a mixed ration, otherwise the butter will be greasy and spongy all the season through. Any pasture that is capable of feeding cattle without the aid of linseed-cake or other feeding stuffs is not so well adapted for good butter-making as permanent or rotation pasture on moderately poor land.

**WINTER FEEDING.**—The feeding of cows in the winter time is an all-important matter in the production of first-class butter. In private dairies, where there is no heating plant available to evaporate the turnipy flavour from the milk, the following daily ration may be recommended for a stall-fed cow in full milk:—

- 7 lb. dried grains.
- 4 lb. cotton-cake.
- 2 lb. crushed oats.
- 2 lb. bean meal.
- 2 lb. wheat bran.
- 14 lb. hay or sound oat straw.
- 28 lb. cooked roots or raw cabbages.

The first five ingredients should be scalded with boiling water and given in a sloppy condition.

**SPACE IN BYRES.**—Cubic space in the byre would only affect the butter in so far as it affected the health of the cow. The condition of the byre or cow-shed, where the cows have to lie, the tidiness of the milkers, the straining of the milk, the washing and scalding of the dishes in which the milk is handled or kept, the purity of the air in the dairy and its surroundings, are all factors in the production of good butter, and any contamination in these earlier stages of the product only leads to disaster.

### *The Creamery System.*

Although the process of separating the butter-fat from the other solids in milk is now universally done by the cream separator at creameries and butter-factories, there are still a large number of makers who use the whole-milk and pan-setting systems for butter-making, from both of which good butter can

be made with careful attention. Still I am of opinion that in the near future the bulk of all our home-made butter will be made on the creamery system, where every precaution can be taken to remove possible contamination, and give complete control over what is known as the ripening process of the cream, and also in order to get the butter on the best market it must be produced in large quantities.

In following a description of the process as it is or should be done at the most up-to-date butter-factory, where the milk is collected from different farms, once a day in the winter and twice daily in summer, doubtless those readers who treat their own milk and cream at home for butter-making will realise that they may quite well carry the leading parts of this practice into their own systems. And here, while it is desirable that the cows should be fed in such a way as to assist the factory manager to produce good butter, it is not so imperative as if the butter were made at home, because the moment the milk reaches the butter-factory it is pasteurised (heated) to  $160^{\circ}$ , which kills all the germs that would affect the flavour of the butter, and in this way he gets over most of the difficulties of untidy milking, indifferent feeding, careless transit, or infectious disease.

At this temperature the milk passes through the separator. The cream goes over one cooler, and the separated milk over another, the cream finding its way into a ripening vat and the separated milk back to the farmer, or to the open market, free from germ life and perfectly safe for human consumption, and without any risk of spreading infection.

Now is the all-important moment for the factory manager. He has got the cream under his command, and must at once proceed to develop that quality and quantity of lactic acid required to give the butter-fat that aroma which is so essential. The kind, the degree, the slowness or rapidity of the action of the acid in the cream or milk before churning, are the main features in first-class butter-making under any process, and this leads me to deal with what is commonly known as a "starter."

### *A "Starter" in Butter-Making.*

There can be no doubt that a great deal of the inferior butter produced is due to a lack of knowledge on the part of the butter-maker as to how the cream ought to be prepared for churning. The majority of dairy farmers and creamery assistants have heard of the "starter," and are aware that this is advocated by the best buttermen for the production of a full flavour, uniform texture, and, most of all, good keeping qualities

in the butter. There are still many, however, who seem to have vague ideas as to what a "starter" is, and how it is to be obtained and applied in the making of dairy produce.

Long ago, before we had any scientific instruments, such as the compound microscope, to enable us to examine, with a certain degree of accuracy, the organisms which are concerned in the souring of milk, our forefathers knew that by adding sour or buttermilk to that which was set for churning the process of souring in the fresh milk was accelerated. With this knowledge they were able in some degree to control the periods of churning. In the colder weather a quantity of buttermilk was added to the sweet milk on setting it, while during the summer months this would be withheld. Here we have two main factors playing an important part in the ripening process—viz., the sour or buttermilk and the heat.

When we make an examination of sour milk, we find that there are present innumerable numbers of minute organisms possessing life and capable of converting certain substances into simpler compounds, and it has now been definitely established that the souring of milk and cream is due to a certain class of bacteria which convert the milk-sugar or lactose into lactic acid. But milk has been found to be an excellent medium for the growth of other than the lactic acid bacteria, and consequently we find such organisms as those which produce a soapy appearance and taste to milk. Stringy milk, red milk, taints and odours which the butter-maker knows, are not at all conducive to the production of first-class butter.

If we can gain a knowledge as to how these objectionable organisms may be destroyed, or as to how their development may be retarded, it is obviously a point in favour of the dairymen. The whole aim of the successful butter-maker is to employ the lactic acid bacteria, or such a class of bacteria as produces the finest aroma—to engage them, as it were, as an employee, and to destroy the objectionable germs.

When we speak of a "starter" now, we do not mean a quantity of random buttermilk, but a culture of bacteria which we know from experience to be capable of ripening the cream to the best advantage. That cream or milk must be ripened for the best results is a point beyond debate, and we consider that the process is complete when 0.75 per cent of acid has been produced.

At one time it was a difficult matter to obtain a good "starter"; should matters go amiss in the dairy, cultures of bacteria were and are still sold in a preserved dry or liquid medium. Much difficulty may be experienced by the novice in preparing from the culture a "starter" ready for adding to

his cream, as these cultures may have to be propagated before use, and so our leading firms, who supply dairy requisites, have placed on the market a "starter" prepared in milk and ready for use.

For creamery use as many as 100 gallons of "starter" may be required daily. Here the best method is to sterilise sufficient skim-milk and inoculate this with the prepared culture after it is ready for use. This has to be done daily, and milk inoculated one day being coagulated the next. By sterilising the skim-milk and rendering it germ free, the work of the desired bacteria is not impeded. If the culture is simply added to the ordinary skim-milk without being pasteurised, then there may be present other germs, and so the work of the culture is impaired and the butter-maker courts trouble.

For the farmer who does not make butter daily, and is only churning a small quantity, it may be for the household wants, we have found that very good results are obtained when a fresh "starter" is procured about twice a-month. This "starter" is added to the cream as soon as it is separated, and the butter-milk from this cream, when churned, added to the fresh cream for the next churning, and so on. After two or three churnings, the buttermilk becomes weak, and hence the necessity to procure a fresh "starter."

For the dairy farmer whose business is butter-making, we must recommend, as in the case of the creamery, the daily making of a "starter." It is a difficult matter to state the quantity of "starter" that should be added to cream and milk. But it is better practice to ripen at a low temperature by means of a liberal amount of "starter" rather than to add a small quantity and ripen at a high temperature. We consider that a very suitable temperature for ripening cream lies between 55 and 58 deg. Fahr.; with a fair amount of "starter" this may easily be done in twenty-four hours.

To the list of crops grown the dairy farmer has now to add the lactic acid bacterium, and it may not be surprising when we add that there are many weeds infesting this crop, and usually the circumstances favouring such pests as stringy milk bacterium and allies are just the circumstances favouring the growth of tuberculosis, typhus, and a host of other pathogenic germs. A very good way to cultivate these deadly weeds and their troublesome friends is simply to be negligent, pay little heed to the scalding of utensils, and ripen the cream in any corner. On the other hand, you may enlist the bacterium as one of your most faithful servants by a little care and a great deal of cleanliness.

*Churning, Working, &c.*

Having added a pure culture immediately the cream is separated and cooled to the proper temperature, the cream may be stirred at intervals, or very slowly continuously, and in twenty-four hours it will be ready for churning.

The process of churning, washing, and working is of small importance in comparison with the process of flavouring by steeping the fat in a proper quantity of selected acid, only the churning and working must be done without violence, which destroys the grain and general texture; and moderation in washing is necessary, otherwise any advantages gained by the "starter" may be washed away and the colour destroyed.

*Packing Fresh Butter.*

The making up of butter is a matter of taste, according to the market. The packing of butter for the fresh-butter trade is best done by wrapping each roll or brick or print in pure parchment paper, packing the rolls or squares on end in boxes made the exact size of so many rolls each way, and the exact depth to suit the length of the roll. The round print, being ornamented on the top, can be conveyed only in boxes with trays, and only one layer on each tray, with the top marked "this side up." This is only necessary when the butter is made up at the fountainhead. A common method is to send the fresh butter in bulk, and make it up at the retail shop: the only drawback to this system is that the retailer loses about 4 lb. per cwt. in turning the scales in weighing it into  $\frac{1}{2}$  lbs., and has to provide the parchment.

**SALTING.**—In salting butter, from  $2\frac{1}{2}$  to 3 per cent of pure dairy salt should be used, guaranteed 98 per cent soluble; very little working is required, and should be done gently, two workings at intervals of at least four hours, with the butter covered up from the air.

For packing salt butter, wooden boxes, kegs, and firkins are the best; the kind of wood used must be free from resin, and parchment, steeped in preservative, should be placed as lining all round the inside of the keg. The packing should be carefully done so as to leave no openings for air, and the lid as close to the butter as on the sides or bottom. After packing, and to get the best results in a distant market, the kegs, immediately they are sealed, should be placed in a cold store for four to five days at a temperature of  $45^{\circ}$  before they are sent away. After this consignments may be sent anywhere. For the United Kingdom ordinary precaution is all that is required, for over-sea transit cold storage at  $45^{\circ}$  is needed all the way.

*Marketing Butter.*

During the last fifty years an entire change has come over our marketing system in the provision trade. Half a century ago every town had its own weekly butter-market, where the surrounding farmers' wives and daughters came with their weekly supply of butter and eggs, and the housewives of the town came also to get their weekly supplies direct from the producer. I can well remember my mother taking her weekly journey with two loaded baskets, one on each arm, away to the market, and while the young folks may not have gone far with her on the outward journey, they were always at the cross-roads meeting her coming home; and I can also remember that the prices then were 1s. in summer, 1s. 4d. to 1s. 6d. per lb. in winter. About 1860 two potent factors were beginning to work against this system. Holland and Denmark had begun to consign butter to wholesale houses, who in turn were offering it through travellers to retail grocers with much perseverance. On the other hand, the habits of the housewives and general consumers were changing. They could no longer go to the market with a "mutch" and a shawl, and to put on a "full rig-out" in the forenoon was out of the question, so these two forces very soon blotted out what was known as the butter-markets in Scotland.

There are still a few butter-markets in England, the largest of which I know is at Carlisle, which is largely supported on the buying side by some old firms of biscuit-makers, who get home-made butter with more "body" for their purpose, and at a cheaper price in the summer than they can buy in any other market.

*Grocers' Carts.*

No sooner had the butter-markets throughout the country been abolished than we had introduced the most pernicious system of grocers' carts, an economic blunder that is without parallel in any other business in the country. The butter-makers, especially the smaller ones, are entirely at the mercy of the itinerant merchant, who goes round buying tons of butter for which he has no household customer; his only dumping-ground is the biscuit-maker, and by the time he gets it collected and sold the rancid has contaminated the best, and the whole lot for baking purposes is worse than margarine. The baker will only take it at all, because the grocer takes his biscuits. The raw material to begin with, in every case, would be equal in value at one stage to the best butter that can be made, but the low price for the finished article offers no incentive to produce a first-class article. The good must be paid for at the same price

as the bad, and so what ought to have been sold, if properly marketed, at 1s. per lb., is parted with at 6d., the buyer in many cases making a loss at that, but recoups himself by taking a higher price for goods bartered to the butter-maker.

This system is so grossly bad that it is a disgrace to our common intelligence. But what is the remedy? Combination, co-operation, collect the raw material—milk or fresh cream—at common centres, handle it on the most scientific principles, place trained dairymaids in these centres, produce butter in bulk, and buyers will be clamouring to get the product, which will be the choicest home-made butter. The prices, according to past experience and present prospects, will not be less than 1s. per lb. on the year's average, equal to 30% more than is realised at present in many counties in Scotland.

### *Progress in Ireland.*

Ireland is working out its own agricultural salvation on these lines; there has been no glut in the market, although Ireland is landing hundreds of tons more butter in the English market annually than it did ten years ago. The consumption of butter is increasing faster than the increase of the population, and there is ample room for a large increase in home-made of the choicest brands at a higher price, provided it is put in the market in a common-sense way, as is done with other commodities in the provision trade.

### *The Middleman useful.*

To try to eliminate the middleman out of the butter trade is folly. The capital, intelligence, and vital force there is in the wholesale provision trade is immense, and the wisest policy for country butter-makers is to take advantage of this powerful ally to get the best markets for their goods. There may be exceptional cases where the consumer may be got at directly, but, generally speaking, the largest centres of consumption can be reached only through a wholesale house.

As a rule, with butter as with other agricultural products, the best plan is to sell when it is ready for the market. The risks from "keeping up" are generally costly.

### *Butter-Milk.*

Butter-milk is a valuable bye-product of butter-making. At one time in Scotland it was largely used for household purposes, but owing to the want of knowledge how to ripen or sour the milk and cream to produce the best aroma required in the best

butter, and to give the butter-milk that body and flavour essential for dietary and medicinal purposes, it is now very little used in families. Even for baking scones and cakes it has lost its effective power.

The introduction of a pure lactic culture in the souring of milk and cream should, we think, in a short time revive the butter-milk trade. The railway carriage from inland creameries to large towns will be a hindrance to a profitable outlet; still, first-class butter-milk is being sent daily just now from Lanarkshire to London, and the demand would be increased if the pure article could be had in bulk. There are many people who would prefer butter-milk to beer as a beverage, and this improvement by the new process of souring will undoubtedly enable butter-makers to offer this bye-product in a more palatable form than at present.

Fresh separated milk can also be treated with a pure lactic culture, and at certain seasons of the year would bring a higher price sour, for baking purposes, than if sold sweet.

## ROTATION OF CROPS.

By ANDREW HUTCHESON, Beechwood, Perth.

THE last half century has witnessed many changes in agricultural practice, and in no direction, perhaps, has there been more than in the cropping of the land. In many leases long ago, and even in some modern ones that are not up to date, long detailed clauses are inserted as to the cropping of the land. In most leases nowadays the tenant is only bound not to mis-crop or deteriorate the land, but to manage it according to the rules of good husbandry. In many old leases heavy penalties are provided where the prescribed method of cropping is departed from, but in modern leases it is stated that any question of this kind is to be referred to arbitration, and is to be settled on the ground of any deterioration to the holding.

As regards the sale of produce, for example, some leases have very severe restrictions, and others again allow the disposal of anything provided an equivalent in manure is returned to the farm. It was very absurd to prevent a farmer from selling straw at from 40s. to 50s. a ton, or turnips say at from 15s. to 20s. per ton, as these prices are greatly in excess of the value of those products if used on the farm.

All such clauses would now seem to be inoperative in view

of the Agricultural Holdings Act of 1906, which came into operation on the 1st of January 1909. Clause 3 of that Act reads as follows:—

“(1) Notwithstanding any custom of the country or the provisions of any contract of tenancy or agreement respecting the method of cropping of arable lands, or the disposal of crops, a tenant shall have full right to practise any system of cropping of the arable land on his holding and to dispose of the produce of his holding without incurring any penalty, forfeiture, or liability: Provided that he shall previously have made, or, as soon as may be, shall make, suitable and adequate provision to protect the holding from injury or deterioration, which provision shall in the case of disposal of the produce of the holding consist in the return to the holding of the full equivalent manurial value to the holding of all crops sold off or removed from the holding in contravention of the custom, contract, or agreement:

“Provided that this subsection shall not apply—

“(a) In the case of a tenancy from year to year, as respects the year before the tenant quits the holding or any period after he has given or received notice to quit which results in his quitting the holding; or

“(b) In any other case, as respects the year before the expiration of the contract of tenancy.

“(2) If the tenant exercises his rights under this section in such a manner as to injure or deteriorate the holding, or to be likely to injure or deteriorate the holding, the landlord shall without prejudice to any other remedy which may be open to him be entitled to recover damages in respect of such injury or deterioration at any time, and, should the case so require, to obtain an injunction, or in Scotland an interdict, restraining the exercise of the rights under this section in that manner, and the amount of such damages may, in default of agreement, be determined by arbitration.

“(3) A tenant shall not be entitled to any compensation in respect of improvements comprised in Part III. of the First Schedule to the Agricultural Holdings Act, 1900, which have been made for the purpose of making such provision to protect the holding from injury or deterioration as is required by this section.

“(4) In this section the expression ‘arable land’ shall not include land in grass, which by the terms of any contract of tenancy is to be retained in the same condition throughout the tenancy.”

These clauses seem to be rather loosely worded, however, and may give rise to a good deal of difference of opinion, and even lead to the law courts. The expression “the return to the holding of the full equivalent manurial value” is a very wide

provision and not easily construed. There is no doubt that the best means of returning fertility to the soil is by a judicious and liberal use of feeding stuffs by cattle and sheep. As a rule, there is too little of these feeding stuffs used.

The cake bill of most well-managed farms is often as much as the rent, and in some cases very much more. We have in our mind's eye farms rented from £600 to £700, where the cake bill always runs about £1200 or so. Of course artificial manures can also be used to maintain the fertility, but they are not so lasting in their benefit as well-made farm manure enriched by a liberal supply of feeding stuffs.

Every locality has its own favourite rotation, but there are some rotations rather peculiar, and perhaps unknown to some of our readers. It is rash for a new-comer to a district to rush and alter the rotation carried on in that district. This should only be done after due and deliberate thought, and in many cases by trial on a very small scale before going in for sweeping changes.

#### *Rotations on Heavy Soils.*

In the Carse of Gowrie, which is for the most part stiff clay, we have generally an eight shift—bare fallow, wheat, beans, wheat, turnips, barley, grass (cut for hay), and oats. This, however, is sometimes varied. Mr James Kidd, who farms the holding of New Farm, Errol, on the estate of Sir William Ogilvie Dalgleish, farms as follows: his farm is of stiff clay, with the exception of about 10 acres of black land on a bank. These 10 acres have been constantly in turnips for twelve years, and Mr Kidd writes me that the turnip crops have always been good and without a trace of disease. Of this farm 60 acres have been laid down to permanent pasture and 23 acres to timothy hay, which latter is cut every year. The pasture has been down for twelve years and is doing well. Mr Kidd values it at fully £2 per acre. The timothy is also twelve years old, and yields on an average 3 tons per acre. The remainder of the farm is cropped thus: bare fallow, oats, barley (dunged and sown out with grass seeds), hay, hay, and oats. This is a very inexpensive rotation and entails little hand work. A large amount of hay is grown, but a ready market is found for it in Dundee and district. This rotation obviates the great difficulty of growing turnips successfully on stiff soils.

It is perhaps not generally known that turnips can be grown with perfect immunity from finger-and-toe on the same field for any length of time provided no contaminated dung is used. It is the intervention of other crops that seems to account for this dire scourge.

**TIMOTHY MEADOWS.**—The laying down of clay land to timothy is also a very economical way of farming strong soils. Immense crops can be grown, and many keepers of horses prefer timothy to ryegrass for horses employed where there is a heavy draught. If a division of a farm is kept in timothy for some years where hay is not sold, it provides winter food for the horses on the farm, and allows the other breaks sown out with grass to be depasturised the first year, and this always secures a better pasture in the years to follow than when hay is cut the first season.

In laying down land for timothy hay, to be cut every season, care must be taken that the land so laid down is cleaned and in good heart. Along with the timothy, perennial ryegrass and clover, red clover especially, must be sown. In the first year little timothy grass is seen, and sometimes not a great deal in the second season, but the ryegrass and clover fill up till the timothy takes possession.

It is not good practice to run sheep on land sown down to timothy either in the spring or autumn, for the first two years at any rate. After that there is not much harm done by putting sheep on the aftermath. When sheep are put on timothy in the first season they seem to eat the heart out of it and prevent strong growth. Timothy meadows and fields are better to be damp-bottomed. To ensure a full crop of timothy hay a liberal top-dressing is required, and every second or third year at any rate a good application of well-made and rotted farmyard manure will well pay itself.

When made into hay timothy does not take so long as ryegrass to dry, as it is strong in the stem. In a very fine summer day we have cut timothy early in the morning and had it coled the same afternoon. From two to three tons per acre is a good average crop of timothy hay, but crops weighing up to four tons per acre have been grown.

Another rather peculiar system of cropping is practised by Mr Thomas Hope on the farm of Big Powgavie, Inchtute, on the estate of Rossie Priory, belonging to the Right Hon. Lord Kinnaird. This rotation is as follows: bare fallow, turnips, barley, hay, hay, oats, beans or potatoes, wheat. Here the turnips follow bare fallow, and a far better mould is got in the strong soil than would be possible in any other way. Bare fallow is rather an expensive preparation for a turnip crop, but it is an effectual one.

#### *Rotation on "Easy" Soils.*

Coming to the rotation of cropping on easy soils and black soils, we find different methods are pursued according to the

situation and locality. The ordinary six shift—viz., three years' pasture, with oats, turnips, and oats or barley sown down—is known to all. Then we have in some districts a seven shift—viz., two years' grass, oats, potatoes, wheat, turnips, barley sown down. Then there is what is called a close six shift—viz., barley sown out with grass and clover seeds, hay, oats, potatoes, wheat, turnips.

**POTATO-GROWING.**—In some early districts, and even where not very early, we see the half of the farm nowadays devoted to potato-growing. In some recent years this has been very profitable, but with the low prices of the potato crop in 1908 this practice was not so remunerative. In order to have an early and abundant crop of potatoes, growers have now resorted to sprouting their seed in boxes kept in a dry and moderately warm place. By this process the tonnage per acre is considerably increased, and the crop comes to maturity at an earlier date. This course of cropping would not bear indefinite extension, and to all appearance there is plenty of land under potatoes, and there is no room for further extension.

These, with many deviations, are the courses of cropping generally pursued, but many circumstances may occur to prevent these being regularly carried out, the weather especially being often a determining factor. In the autumn of 1907 the season was so late, and in many cases the ground so wet, that it was impossible to sow winter wheat, and either oats or barley had to take its place in the spring.

**CATCH-CROPS.**—In some districts the system of catch crops is greatly in vogue. That of early turnips or ryegrass or rape after a crop of early potatoes is common on the Ayrshire coast, and has made inroads into other districts. A catch-crop of clover and ryegrass is now often sown with the grain crop—not for a hay crop next year, but merely for the pasture it affords in autumn and early winter before it is time to plough the stubbles. On very easy soils this catch-crop is depasturised until far on in the spring, when it is ploughed up just immediately before sowing the green crop. Some have a fear that this method of sowing clover and ryegrass may have an effect on the fields so sown when they come to be laid down for hay and pasture in the regular course; but this, so far as is known, has not been found to be the case, as the seeds sown for a catch-crop are never brought to maturity in the same way as when they are ripened for hay or when they are pastured. The greatest drawbacks for this kind of catch-cropping is that in a wet or late season it may retard the grain among which it is sown from coming so quickly to be fit for stacking.

**WINTER TARES.**—Winter-sown tares are also grown in early sheltered localities, and they come in for cutting at a very early

date in spring—about the beginning of June. If well manured, winter tares grow a very heavy crop, and are suitable either for cattle in the house or for eating on the ground by sheep with hurdles. Immediately after they are removed the land is ploughed and some kind of late-growing turnip is sown. With a favourable autumn these often come to be a good crop, and with open weather will grow far into the season.

### *Land going out of Cultivation.*

Perhaps the most noticeable feature in the cropping of land during the last half century is what we would call the want of cropping, or, in other words, the laying of land down to permanent pasture. This, of course, is to be deplored, as it is one of the factors at work in causing the decay of our rural population, of which we hear so much nowadays. The causes of this course of procedure is to be found in the low prices prevailing for all kinds of agricultural produce, and the inability to grow any crops to profit on many classes of soil. But this laying down of land to permanent pasture does not get over the difficulty of making farming pay, as too often, as was the case last season, cattle bought in the spring left little or nothing for their grazing. So much land is lying now in permanent pasture that more stock is required in the spring than in the autumn, and if there is any failure in the green crop or deficiency in the straw of the grain crop, it happens that cattle and sheep are sold for less in the autumn than what they were bought at in the spring. Economic laws, however, rule here as well as elsewhere, and if prices for grain or green crop again fall so low as they have done, land is bound to go out of cultivation and be laid down to permanent pasture, whether there is profit in it or not, for in that condition it involves less outlay for labour.

### *Small Holdings.*

Many would like to see a great portion of this permanent pasture laid out in small holdings, and it would be a capital thing for all concerned and for the country at large if that could be done with any reasonable prospect of success. It is hardly possible to mention the subject of small holdings without party politics being introduced, but this ought not to be so. If any portion of the large extent of land now in permanent pasture could be profitably divided into small holdings, it would be to the benefit of all concerned; but how this could be done, growing ordinary crops at present prices, is very difficult to see. In the neighbourhood of large towns, dairying, poultry-keeping, and the growing of vegetables, fruit, and flowers may be made

to pay on small holdings, but with oats between 18s. and 20s., barley 20s. to 25s., and wheat 25s. to 30s., a living cannot possibly be got from these crops on small patches of land.

### *Fruit-Growing.*

The growing of fruit, especially raspberries, was very unprofitable last season; the crop was small and the prices small also—a very bad combination in any industry.

It looks as if the cultivation of the rasp had seen its utmost limit. One cause for the depreciation in the price of this fruit is that formerly a large quantity of the produce was used in the manufacture of a certain dye, but now a chemical substitute has been found for this, and the quantity used for that industry has now been thrown on the preserve market.

The black currant mite has also been the cause of great loss to the fruit-growing industry, and nothing seems to cure this destructive pest but the burning up of the whole of the infected bushes. Strawberry growing is fairly profitable, especially on very early situations where the fruit can be placed on the market in early summer.

### *Dairying.*

Cropping is very different in different localities, but perhaps farmers are too slow to change and adapt themselves to the times. One thing seems to be certain, that more attention must be given to dairying. It has been said that dairy farming is equivalent to "white slavery," but with the extension of the factory system and also of the milking-machine, the work of the dairy is rendered much less arduous and much more pleasant. Cows do not require to be milked at such unearthly hours as in the case of dairies in the vicinity of large towns. Sanitary science is gradually forcing the dairy out of our large towns into the country. It seems that good and pure milk ought to be more easily got in the country than in the towns. In some of these city dairies the cows are not out of the byres for several months on end, and the produce on which they are fed has all to be carried to them.

Milk at certain seasons of the year is very scarce and in good demand, and it would be for the benefit of the population at large if the consumpt of milk were largely increased. When speaking about tuberculosis and its attendant dangers, a well-known doctor once said that more children had perished from an insufficient supply of milk than through any contamination of the supply.

As time goes on, no doubt, many alterations in the cropping

of the soil may come into vogue. In a forty years' experience of farming in Scotland we have witnessed many changes in cropping and otherwise, and while what the future has in store is unrevealed, and wisely so, there is little doubt but that the energy and pluck of the cultivator of the soil will ever remain, and be equal to whatever circumstances may arise.

## BACON-CURING IN SCOTLAND.

By LOUDON M. DOUGLAS, Edinburgh.

ALTHOUGH bacon-curing has never been a leading industry in Scotland, it is gratifying to know that the only complete text-book on the subject,<sup>1</sup> written in earlier times, was by a Scottish farmer named Robert Henderson, who carried on business in Dumfriesshire about the beginning of the nineteenth century. Although his treatise on the 'Breeding of Swine and the Curing of Bacon' is somewhat out of date, he yet managed to epitomise within its 139 pages a good deal of useful information relative to swine husbandry as an essential department of agriculture. Incidentally he gives us some references to the ancient Scottish breeds of pigs, as for example: "It appears that in the Highlands of Scotland large flocks of swine have been kept and reared in the glens, in the same manner as horses, cattle, and sheep. About forty-five years ago large droves of Highland swine were brought into Annandale and sold to the farmers, who bought them more from motives of curiosity than of profit. They were very small, with long bristles upon their backs, and were sold when one year old or upwards for 4s. or 5s. per head."

About 1760, we are told, one could scarcely have found twenty swine in any parish throughout Dumfriesshire, but about 1770 they became more plentiful, and this is attributed to the fact that the breeding of swine was encouraged by such landlords as Lord Graham, "who allowed his tenants to retain their Lammas and Candlemas rents in their hands for the purchase of pork, which they manufactured into bacon and hams for the London market."

<sup>1</sup> '*A Treatise on the Breeding of Swine and Curing of Bacon, with Hints on Agricultural Subjects.*' By Robert Henderson, farmer, Broomhill, near Annan, 1811.

*The Highland Hog.*

It appears that in those days there was a distinct type of pig known as the Highland hog, and from the various references which are made to it in the agricultural literature of the times it must have been a somewhat unprofitable animal. Thus Culley, in his book on Live Stock,<sup>1</sup> refers to it as the Highland or Irish breed, and describes it as "a small, thin-formed animal, with bristles standing up from nose to tail, and exceedingly bad thrivers. We meet with considerable herds of them upon the moors in different parts of the Highlands of Scotland, picking up the wild berries, especially in Thurso, Caithness."

Culley goes on to say that he has found the same pig in Ireland; and no doubt he refers to the original Irish pig, which is now practically extinct, although remnants of the race are to be found in Connaught and the west.

Henderson again states that "there is another species of swine in Ross-shire, mostly black spotted, and of a very plump make. It seemed to be easily fattened, and early got to the proper size for porking. It is much superior to that diminutive creature which is so common in Fifeshire and the Lothians, which is neither easily fattened nor arrives at any considerable weight."

But Henderson has a very definite opinion about the inferiority of the Scottish breeds, and strongly recommends the introduction of the Berkshire hog, because, as he says, "this kind will grow to a large size, is easily fed, small boned, and of a handsome make." He thinks that a farmer who has 128 acres in crop may with advantage feed twenty swine, and this rate may be generally followed by those who care to adopt this branch of husbandry. He also records that the intelligent farmers of Norfolk say "that if it were not for their swine they could neither feed their families nor pay their rents."

*Recent Developments in Scotland.*

Since Henderson's time many changes have taken place in Scottish agriculture, but progress in the development of pig-breeding has been slow. Unfortunately we have no records of the number of pigs kept on the farms in his days, so that we are unable to state the relationship in this branch of agriculture between then and now. We know, however, that whereas in Ireland and England bacon-curing has become an extensive industry, it has progressed but slowly in Scotland.

<sup>1</sup> 'Observations on Live Stock, containing Hints for choosing the Best Breeds and the most useful kinds of Domestic Animals.' By George Culley, farmer, Northumberland.

*Statistics.*

Since 1876, however, we have had fairly accurate returns of pigs, and these show considerable fluctuations. In 1876 the numbers in Scotland were estimated at 154,000; in 1886, at 133,890; in 1896, at 144,615; and in 1906, at 130,199. The decline in 1906 was due principally to the presence of disease and the curtailment of breeding, which it necessarily involves. But since then there has been a steady increase, so that in 1908 the figures stood at 143,784.

In comparing the figures for Scotland with England and Wales, it is noticeable that Scotland is far behind the others. The comparative statement is as follows:—

## NUMBER OF PIGS IN GREAT BRITAIN IN 1908.

England	.	.	.	2,439,087
Wales	.	.	.	240,611
Scotland	.	.	.	143,784

The distribution of pigs in Scotland is somewhat unequal, the counties with the largest numbers being Aberdeen, Ayrshire, and Wigtown, and in some of the others the numbers are very small indeed. The complete statement which follows is the latest available, and was compiled in June 1908. For purposes of comparison the figures for 1907 and 1908 are both given:—

## COMPARATIVE STATEMENT for the Years 1907-8, showing the number of Pigs in the various Counties of Scotland.

Names of Counties.	1908.	1907.	Names of Counties.	1908.	1907.
Aberdeen . . .	13,778	14,243	Kirkcudbright . . .	9,970	9,449
Argyll . . .	4,616	4,402	Lanark . . .	7,226	7,026
Ayr . . .	13,936	13,960	Linlithgow . . .	1,431	1,415
Banff . . .	3,610	4,001	Mid-Lothian . . .	8,798	9,827
Berwick . . .	3,974	3,547	Nairn . . .	627	776
Bute . . .	616	596	Orkney . . .	2,333	2,623
Caithness . . .	1,684	1,763	Peebles . . .	590	630
Clackmannan . . .	940	1,164	Perth . . .	7,548	8,181
Dumbarton . . .	1,249	1,269	Renfrew . . .	1,444	1,300
Dumfries . . .	9,280	9,362	Ross and Cromarty . . .	4,811	4,508
Elgin, or Moray . . .	2,798	2,922	Roxburgh . . .	3,159	2,862
Fife . . .	5,884	6,359	Selkirk . . .	447	384
Forfar . . .	6,849	7,667	Shetland . . .	1,411	1,481
Haddington . . .	1,939	1,864	Stirling . . .	1,945	2,199
Inverness . . .	2,550	2,674	Sutherland . . .	764	732
Kincardine . . .	2,839	3,142	Wigtown . . .	14,048	13,640
Kinross . . .	690	646			

*Modern Breeds of Swine.*

We have seen that, in earlier days, the breeds of pigs in Scotland were of an extremely unlikely character, and no doubt this has had to do with the absence of development in the manufacture of pig products. In recent years there has been quite a rapid advance in the introduction of the modern breeds of swine, and it may be truly said that while the numbers are rapidly on the increase, they include all the recognised modern breeds. The Highland breed, which has already been referred to, and which seemed to have been only one step removed from the wild-boar type, has now happily been entirely eliminated from the country.

There are five principal breeds of swine which are recognised in the United Kingdom, and these are—(1) the large White Yorkshire; (2) the middle White Yorkshire; (3) the Berkshire; (4) the Tamworth; (5) the large Black.

There are, of course, many others which show distinct characteristics, such as the Small White, the Suffolk Black, the Gloucester breed, and the Small Black, but none of these are of sufficient importance to warrant them being classified along with the principal breeds referred to.

The British breeds of swine have obtained a world-wide reputation, and in all the European countries, and others beyond the seas, the modern races of swine have had their origin in imported British stock; and it is due to British breeders to say that they have, by a continuous process of careful selection, brought the distinct breeds to an extremely high state of perfection, a fact which is recognised in many countries besides their own.

*The Bacon Pig.*

In so far, however, as bacon-curing is concerned, the class of pig that is wanted does not belong to any particular pure breed, and cross-bred pigs are just as valuable for bacon-curing purposes as are those belonging to the selected breeds. What is required is a pig of such a conformation that it will, as nearly as possible, fill a parallelogram, and which will yield the greatest amount of flesh with the minimum of bone. These attributes are to be obtained only by watching carefully the breeding and the feeding, because these two features are essential in swine husbandry.

The size of pig wanted for bacon-curing purposes is one which weighs about 16 stone live-weight—that is to say, about 224 lb. or 2 cwt. The “dead-weight”<sup>1</sup> will be about 168 lb., and

<sup>1</sup> There is about 25% loss from the live-weight to the dead-weight.

for the generality of purposes this is the most profitable kind of pig to produce. There are, however, other styles of pig which are in demand for special trades. The ham trade, for example, requires a small pig which will weigh about 112 lb. dead-weight, but this is about the smallest size that can be usefully handled in the bacon and ham trades. A 12-stone



Fig. 10.—Feeding sties for pigs.

The conditions under which pigs are fattened contribute largely to their quick development, and well-designed sties make a great difference in the rapidity with which pigs grow.

pig should be produced in about seven months with steady, careful feeding, provided that there is a plentiful supply of separated milk and that the pigs are comfortably housed (see fig. 10).

#### *The Relationship of Creameries and Pig-Breeding.*

In many parts of Scotland at the present time there are creameries in which the milk is separated by means of centrifugal machines, and this milk, which contains practically no fat, is set free for pig-feeding purposes. This bye-product of modern dairying is undoubtedly one of the best materials for pig fattening, more especially when used in conjunction with barley or other cereals. It has been calculated that 1 gallon

of separated milk is equal in feeding qualities to  $1\frac{1}{4}$  lb. of barley, so that a mixture of the two must form a highly nutritious feed. The fact that the milk has been deprived of its butter-fat does not alter its feeding properties, as the oil can be supplied from such sources as maize. Of late, however, it has become possible to reconstitute separated milk by means of a homogenising machine, by which cheap animal fat can be added to the milk so as to form a complete emulsion, and for feeding purposes make the milk equal to whole-milk again. Whether such a process will meet with general approbation or not it is impossible to say.

In the absence of milk, pig foods may consist of cooked potatoes, barley, oatmeal and crushed oats, pollard bran, ground wheat, rye meal, and Indian corn. The latter, however, must be ground fine and cooked, and must be used sparingly, as otherwise, if used in excess, it is liable to produce oily meat. All of these foods are available in Scotland, and there is therefore no reason why the best bacon pigs should not be produced there.

#### *Present Centres of Bacon-Curing.*

The counties in which bacon-curing has been mostly developed in Scotland are Ayrshire and Dumfriesshire, and it has been the practice for generations by the farmers in these counties to make annually in the winter a number of fitches or sides of bacon for home use. This practice, however, is dying out, and is being replaced by modern bacon-curing factories. There is no reason why these factories should be confined to the south-west corner of Scotland, as it is quite apparent from the table in which the number of pigs in the country is given, that there is room for bacon factories in many other parts. In this connection it may be said that it has been the experience of Denmark, that wherever a factory has been put down, there has been a steady growth in the local supply of pigs; and farmers in the vicinity of such factories have been influenced to breed and fatten a larger number of pigs than before, owing to the fact that they can, if they wish, follow the pigs to the factories, and be paid on the dead-weight realised, at once.

#### *The Old Process of Curing.*

The old processes of curing in Scotland have passed away, and such a condition of things as is described by Robert Henderson does not now exist anywhere.

"I practised," he says, "for many years the custom of carting my fitches and hams throughout the country to farmhouses,

and used to hang them in their chimneys and other parts of the house to dry ; some seasons to the amount of 500 carcasses. This plan I soon found was attended with a number of inconveniences, having to take along with the bacon, pieces of timber to fix up in the different houses, for the purpose of hanging the flitches and hams. For several days after they were hung up, they poured down salt and brine upon the women's caps, and now and then a ham would fall down and break a spinning-wheel, or knock down some of the children ; which obliged me to purchase a few ribbons, tobacco, &c., to make up peace. But there was still a greater disadvantage attending this mode : the bacon was obliged to hang until an order came for it to be sent off, which, being at the end of two or three months, and often longer, the meat was overdried in most places, and consequently lost a good deal of weight. This method is practised at this day in Dumfriesshire. People in general are so partial to old customs, that it is nearly impossible to remove them" !

Later on he states that bacon can only be cured between September and the middle of April, which, of course, was quite true then, inasmuch as the curing is controlled entirely by the temperature, and it is impossible to cure on the farm during the summer months without cooling machinery or the application of ice. These are the days, however, of mechanical appliances, which can be obtained by people of moderate means. The bacon curer, whether he is in a small or a large way, may now, by the assistance of artificial refrigeration, be entirely independent of the weather, and may therefore cure hams and bacon all the year round.

#### *Present-day Process.*

The Dumfriesshire and Ayrshire cured bacon, such as is produced at the present day, is made by what is known as the "wet cure" process. That is to say, the bacon is immersed in pickle instead of being cured in the dry state, as is the case with Wiltshire bacon. The only advantage of the wet process lies in its being adaptable more easily to curing places where there is no machinery, and where the cooling is derived from a naturally cool cellar, or from a cellar cooled with ice. Both of these methods, however, are primitive, and it is most likely that in the future, bacon-curing cellars in Scotland will be so fitted as to cure meats both in the wet and the dry state.

The process of handling the pigs for curing may be divided up into various sections, namely—(1) slaughtering ; (2) cooling in the open air ; (3) skinning and cutting up ; (4) chilling and trimming ; (5) curing.

*Slaughtering.*—There are various methods of slaughtering, but the most humane is that by which the animal is first rendered unconscious by means of a smart blow with a heavy mallet on the forehead, and the blood may then be easily let out by thrusting a knife in the direction of the heart. This may be accomplished while the carcase is lying on the ground, or it may be done after the carcase is hoisted up by one of the hind feet so as to suspend it to a track-bar. In some cases the live animal is caught up by one of the hind legs by means of a chain to which a running- or slip-hook is attached, and is suspended to a track-bar, and it is slaughtered without being stunned. In a properly equipped factory this process is very expeditious, the bloodless carcase being pushed along the track-bar in less than a minute from the moment of first handling. Whichever process is adopted, it is essential for bacon-curing purposes that the whole of the blood should be let out, and in doing this care should be taken that the knife does not enter either of the shoulders, as otherwise the fore end of the side so touched will most likely be destroyed.

As soon as the carcase is thoroughly free from blood it is thrown on to a dumping-table and the leg-chain removed, or if the carcase has not been hoisted on to the track-bar it can be lifted on to this dumping-table, and is at once rolled into a scalding tank, which can be either circular or rectangular, but must be of sufficient capacity to hold several carcasses. In this scalding tank there must be a sufficient supply of warm water, which is heated to a temperature of about 150° F., at which temperature the hair of the carcase is softened, and after a few minutes' immersion will be easily removed. As soon as it is apparent that the hair can be scraped off, the carcasses are lifted, either by means of a mechanical cradle or by hand, from the scalding tank on to the scuttling table, where they are scraped clean and free from hair. The sinews of the hind feet are then exposed by making slits down the back of the feet and pulling out the sinews with the fingers, and on each carcase a gambrel or spreader is placed, so as to spread out the hind feet, and the carcasses are then raised to an overhead track-bar. In this position they are split down and the intestinal offal is removed, and it is dealt with in a separate department by itself, the various parts being utilised for different purposes. The carcasses are then spread out by means of a gambrel, and when they have been cleansed and thoroughly washed they are pushed along the track-bar into the hanging-house, where the animal heat is allowed to dissipate.

In some parts of the country this scalding and scraping clean is not carried out, the hair being left on the animal, and the carcase is simply hung up, opened, the intestinal offal removed,

and cleansed. As in Scotland the bacon is mostly cured in the skinless state (see fig. 11) and the skins are sold to tanners, the scalding may be dispensed with, as the tanners prefer skins which have not been scalded. Some modern curers, however, are practising the curing of the meat with the skin on complete, so that in their case it is imperative that they carry out the scalding process.

*Cooling in the open.*—This pre-cooling may occupy a considerable time—up to seven or eight hours; but in the average

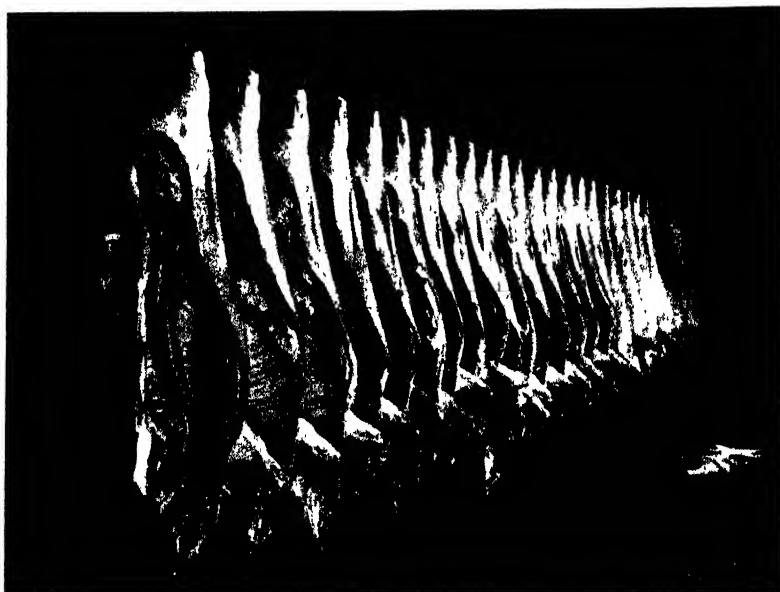


Fig. 11.—*The hanging house.*

The illustration shows the interior of the hanging-house of a Scottish bacon factory where Ayrshire bacon is largely cured. The carcasses are first skinned, and are then hung up on track-bars so as to allow of the excess of animal heat dissipating. This occupies only a few hours, or, if the weather is cool, they may hang all night; after which they are placed in the chill-room and cooled to 38° F.

weather which we have in Scotland the time should not exceed about six hours. The pre-cooling will reduce the temperature of the meat some 20°, and in this condition the carcasses may then be handled without injury or putting them out of shape.

*Cutting up.*—They are then thrown one by one on to benches, and the hind and fore feet are at once removed and the hide is also taken off. They are then split down the middle, severing the vertebral columns in two, and the separate sides are hung by means of hooks inserted through the gammon hough, upon

track-bars. They are then pushed into the chill-room, where they are chilled to a temperature of 38° F.

*Chilling and Trimming.*—This temperature of 38° F. may be attained by modern refrigerating machinery, if properly designed, in about twelve hours; but there must be a continuous blast of cold dry air in the chill-room, and the room itself must be constructed with completely insulated walls, so that there can be no radiation of warm air inwards from the outside atmosphere or leakage of the air contents of this chamber outwards. By circulating the air of the chill-room over a dry cooler, the moisture is arrested and takes with it the floating impurities which are deposited, along with the moisture, on the coils of the dry cooler, in the shape of snow, and this snow, at the end of each chilling, naturally melts and runs away as water. When the sides have reached a temperature of 38° F. they are then removed into the cellar, where the hams are cut off and the rib and forearm bones are removed from the sides. The hams are nicely trimmed, and are then in a condition to be cured. The three-quarter sides are also then ready for the curing process.

*Curing: (α) Hams.*—The curing of hams by modern processes is a comparatively easy matter, provided refrigerating machinery is available. It is necessary to have a cellar which can be maintained at a temperature of 42° F., and in which the air is somewhat moist and not in circulation. The hams may be cured either by the wet process or the dry process, but in any case they have to be purged free from blood. Before proceeding, therefore, it will be necessary to make a pickle in which the hams may be first of all immersed, so as to free them from blood. This pickle consists of 55 lb. salt, 5 lb. saltpetre, 5 lb. dry antiseptic, made up to twenty gallons with water, and boiled and skimmed until quite clear. Sometimes 5 lb. of pure cane sugar is added to this quantity of pickle so as to improve the palatable flavour. Any quantity of the pickle can be made at one time, but it is necessary that the proportions given must be strictly observed, and, as a check, the pickle should be tested with a salinometer, upon which it should register about 100°.

This pickle is used for many purposes in bacon- and ham-curing. It is used for purging hams; it is used for curing hams by the wet process, and it may also be used for curing bacon by the wet process. In the manufacture of whole sides of bacon, cut in the Wiltshire manner (see fig. 12), it is used for pumping into the bacon, so that a uniform pickle may be said to be in use throughout the cellars. For all purposes, however, it must be strictly noted that the pickle should always be cooled

to the temperature of the cellar before use, and never on any account used in the warm condition.

The hams having been nicely trimmed, are thrown into this pickle and allowed to rest there from one day till the next, when they are taken out and the blood vein is squeezed with considerable pressure by means of the two thumbs, which are made to glide along the meat in the direction of the blood vein, and in this way the blood will be pressed out. When this has been done and the hams wiped dry, they may then be thrown



Fig. 12.--*An Irish curing-cellar.*

In Ireland, more especially in the south, whole sides of bacon are cured in the "Wiltshire" manner. These are stacked during the curing process ten deep. The "cellar" shown is that of Roscrea bacon factory. The word "cellar" used to be applied to curing-beds, as, before the advent of refrigeration, such places were usually excavated in the ground for the sake of coolness. Nowadays this is never done, but the name remains.

into a fresh lot of the pickle, or they may be put down on the cellar floor and immediately covered over with an equal mixture of dry antiseptic and saltpetre, on the top of which a heavy layer of fine salt is then put. An average ham weighing about 15 lb. may be cured in twenty-one days. If, however, it is intended that the hams should be kept for a prolonged period, they will require to be in salt a much longer time, and a very good rule to follow is to keep the hams either in pickle or dry salt for one day for every lb. weight, so as to produce "mild cured" hams, and two days for every lb. weight so as to produce

hams to keep for a long time. In connection with these hams which are to be kept for a long period, it is usual to hang them up in the hanging-loft until a blue mould is produced on the surface. This mould is termed the "bloom," but is really produced by decomposition.

(b) *Bacon-Curing*.—The three-quarter sides of boned meat which are left after the hams have been cut off are immediately pumped by means of a force pickle-pump, and the pickle already mentioned is forced into them at the thickest parts. They are then laid in tiers, in vats, formed either of slate or enamelled porcelain, and sometimes of timber, and are sprinkled on the surfaces with an equal mixture of dry antiseptic and saltpetre, and on the top of that a fairly thick layer of fine salt. The sides are piled up in this way until the vats are nearly full, and they are left to cure. As the juices of the meat are liberated and the solution of salt is formed a certain amount of pickle is created, and this pickle becomes a covering liquid in the vats. Nothing really requires to be done to the bacon beyond this so as to cure it, but considerable judgment has to be exercised so as to know whether it is ready to be drawn from the curing-vats in five, seven, or ten days. It altogether depends on the mildness of the meat wanted, and, of course, the exigencies of the market. Sometimes meat is taken out of pickle in two or three days, but it is little more than slightly salted pork then.

The curing of the whole sides with the back-bone and the blade-bone taken out is the Wiltshire method. This is now being practised in many parts of Scotland, and, considering the amount of Wiltshire bacon which is consumed in the country, it is a business which is likely to extend very much in the future. Wiltshire bacon is always produced by, first of all, pumping the whole sides with pickle (see figs. 13 and 14) and then dry-salting them on the bacon bed. They are usually stacked in tiers in ten sides (see fig. 12), making five pigs,—one on the top of the other,—and in this way are cured in about fourteen days.

The Danish bacon, which comes to the United Kingdom in large quantities, is generally cured in the Wiltshire manner, and the special cuts of bacon with which we are familiar in this country are not produced in Denmark at all.

The three-quarter sides which we have referred to in the foregoing, after being cured, are rolled, and in this condition are sent out as rolled bacon, or they are sometimes called "Ayrshire rolls." In any case the rolling is a matter of considerable skill, and it requires a workman who has had some experience in the business to produce the rolls with perfect uniformity (see fig. 15).

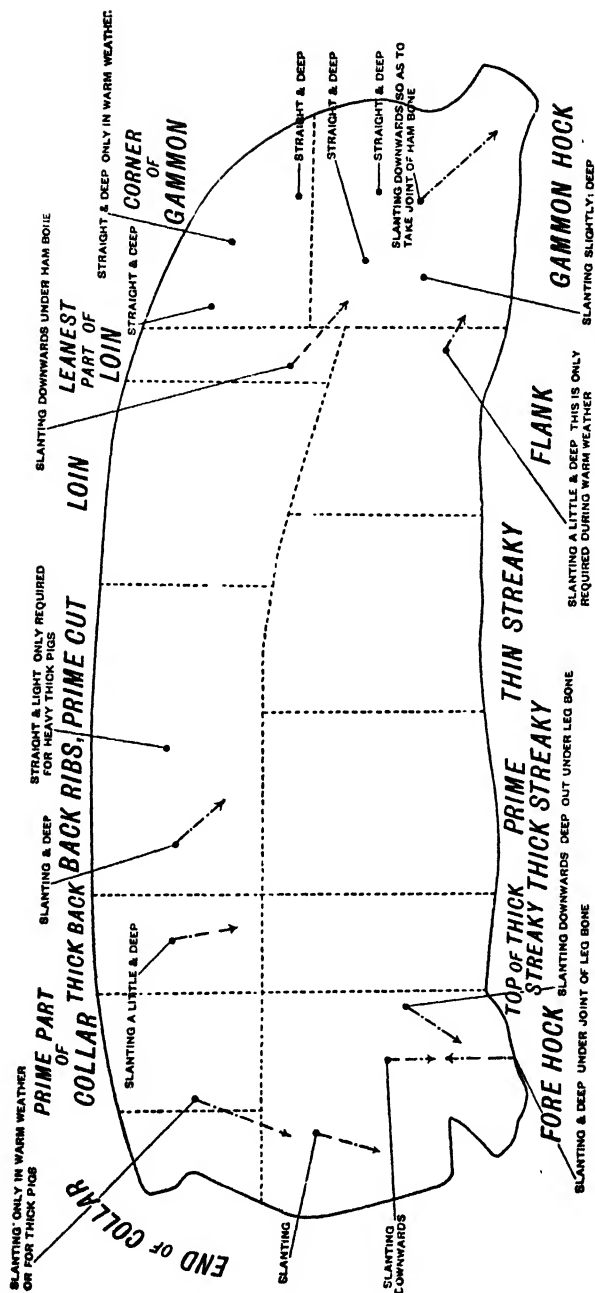


Fig. 13.—A side of Wiltshire bacon.

In this diagram, designed by Mr Loudon M. Douglas, an attempt has been made to indicate the manner of pumping bacon when curing Wiltshire sides. The object of pumping is to ensure the pickle reaching the tissues at once, so as to arrest immediate decomposition.

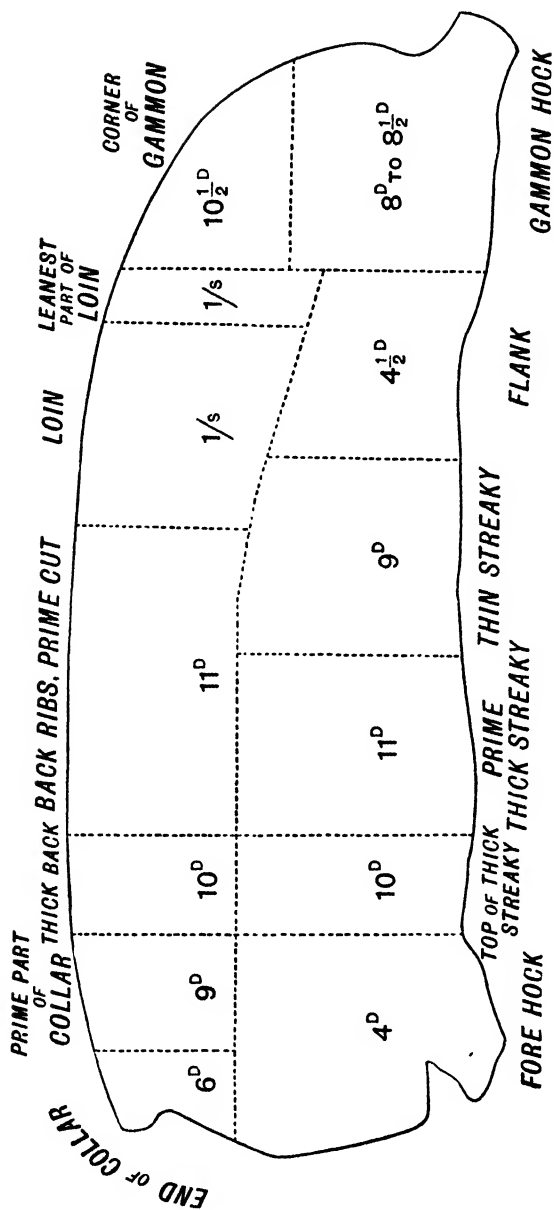


Fig. 14.—A side of Wiltshire bacon, showing average prices obtained for various cuts.

In breeding for bacon purposes regard should be paid to the development of the parts which realise the largest price as set forth in this diagram, designed for the purpose by Mr London M Douglas. The names of the sections shown are what are universally known and adopted throughout the bacon trade.

*Auxiliary Departments.*

The modern bacon factory is not complete without having a sausage department and a lard department. The sausage department is utilised so as to produce sausages and other small goods from the trimmings of the carcasses, and in several factories it is customary to slaughter a number of hogs for the use of the small goods departments alone. There is a large and increasing demand for goods of this nature, and their manufacture has



Fig. 15.—*Rolling bacon at Thornhill, Dumfriesshire.*

The final process in the production of Scotch bacon is to roll the three-quarter sides, after being cured, tightly together, and tie them with a stout string, which is kinked at intervals of about an inch all along the roll. This style of bacon is largely made in the west of Scotland, and is known as "Ayrshire rolls," "Scotch rolls," "Scotch bacon," &c.

proved, to many firms, that they form a considerable addition to the profits of a bacon business.

The manufacture of lard is a necessity also, and there is much beautiful machinery used in producing it in good condition and with a nice appearance. At no time is it possible to get the same price for the lard as is paid for the whole pig, so that the efforts in the lard department are with a view not so much to make a profit as to reduce the unavoidable loss.

In the manufacture of bacon as it is at present carried on in Scotland, there is room for considerable improvement, and future

factories, which will no doubt be erected in the country, are likely to follow such a model as that of Roscrea in County Tipperary, Ireland, which stands alone at the present moment as being one of the cheapest and best designed factories in Europe. Roscrea factory (see fig. 16) has this advantage, because the structure itself is largely made up of corrugated iron. The capacity also is far in excess of what such a factory could be expected to produce if built on the old lines. Thus



Fig. 16.—*Roscrea bacon factory, County Tipperary, Ireland.*

This is the model after which future bacon factories are likely to be constructed. This factory, for its capacity of 750 pigs per week, is by far the cheapest yet constructed in Europe. It contains every modern mechanical appliance, and during its first year of existence (1908) carried off the highest honours in competition at the London Dairy Show.

at Roscrea it is possible to handle conveniently 750 pigs per week, which must be regarded as a large number, when it is remembered that the total cost of the buildings, machinery, land, and formation expenses did not exceed £7000.

### *The Factory of the Future.*

This is the type of factory which will be erected in the future, and it will possess the initial advantage of being able to produce bacon and hams at a very much less cost per cwt. than the older established factories, in which so much capital has unfortunately been sunk.

On the whole, the outlook in the bacon business in the United Kingdom is satisfactory, and there are not wanting signs of a general revival in connection with the industry. This revival has begun in Ireland, it has spread to England, and has also come to Scotland; and it is pleasing to be able to say that one

of the best equipped of the modern factories is to be found at Thornhill, Dumfriesshire. This factory, which is owned by Messrs A. Kirkpatrick & Sons, was completed two years ago. Its capacity was doubled last year, and will in the near future be doubled again. This is highly satisfactory, as indicating the trend of the business in Scotland. This particular factory does not stand alone, and there are others in the west of Scotland in which the progress has also been great. At the moment, it would appear, indeed, as if the members of the agricultural community of Scotland had at last made up their minds that swine husbandry and the manufacture of bacon and other pig products should form a part of the modern scheme of agriculture.

## CARSE FARMING IN STIRLINGSHIRE.

By JOHN DRYSDALE, Edinburgh.

THERE is probably no system of tillage of arable land which has undergone greater change during the last twenty to thirty years than that pursued on the alluvial clay soil, usually termed Carse land, which stretches for about twenty-eight miles along the valley of the river Forth, from a point where the county of Stirling joins the county of Linlithgow to the neighbourhood of Buchlyvie, some fourteen or fifteen miles west from Stirling. It is computed that there are 36,000 acres of clay land embraced in this area.

This land is for the most part flat, and is not more than from 25 to 40 feet above sea-level. Much of the land has been reclaimed at one time or other from the sea, and a very considerable area from moss—as, for instance, at Bandeath, and in the vicinity of Kippen in Stirlingshire, and at Blair Drummond, Polder, and Port of Monteith in Perthshire. There are still many hundreds of acres of good land in these districts lying under a covering of moss, varying in depth from 3½ to 10 feet. The reclamation of the moss land was a very costly operation, the removal of the moss and subsequent draining of the land costing, in some cases, from £20 to £30 per acre. It is little wonder, therefore, that in these days of depressed prices for grain and dear labour, the reclamation of moss land in these districts has been entirely suspended.

In this stretch of carse land there is great diversity in the depth and quality of the soil, and, consequently, there has always been a considerable disparity in the rents paid. For the best of it, rents from of 50s. to 60s. per acre was at one time

paid, and for the medium quality from 35s. to 45s. per acre, and doubtless more money could then be made at these higher rents than to-day under entirely altered conditions, with rents reduced by 20 per cent.

There was a time when much of the carse land was hardly worth cultivating owing to its wet condition, but in the latter half of the eighteenth century a great improvement was effected by thorough draining, and this, combined at a later period with the liberal application of lime, produced a very marked change on the hitherto wet, cold soil. Crops of greater bulk were produced, while the grain became heavier and of greatly better quality.

Even under these improved conditions, tillage operations on carse land require to be conducted with great care, and only those who pursue it with skill, patience, and perseverance need look for satisfactory results. Clay soil is very easily wetted, and tillage operations can be conducted satisfactorily only when the land is moderately dry. Poaching it in wet weather is fatal to good results. In a wet spring it is difficult to get the seed sown in good time, and unless carefully tided, the land is apt to become very hard on the surface when dry weather sets in, thus imperilling the brairding of the young plant. The action of frost has a wonderful effect in rendering stiff clay soil friable and easily harrowed. A good winter's frost is therefore a valuable ally to the carse farmer.

### *Rotation of Crops.*

The usual rotation of cropping on carse land thirty to forty years ago was what was termed the six-course shift—that is, the farm was divided into as nearly as possible six equal divisions, and cropped as follows: first year—oats after ryegrass hay; second year—summer fallow and green crop; third year—wheat; fourth year—beans; fifth year—barley sown out with ryegrass and clover seeds; and sixth year—ryegrass hay. In some cases a seven-course shift was adopted by taking a second oat crop after lea or mashlum (oats and beans). Only a small portion of the farm was allowed to be in pasture, usually just sufficient to graze a couple of cows and their calves.

Under this system the land was continually under crop, and each year under tillage, excepting the section which every sixth year was producing a hay crop. This course was not only very exhausting to the soil, but entailed a great deal of labour and other expense. The lot of the carse farmer, his servants and horses, was one of incessant toil the whole year round. The winter months were occupied with ploughing, threshing, and carting away grain, hay, and straw.

*Beans.*

When a suitable tid (tilth) was obtained towards the end of February, bean-sowing began. This was the crop to which the major portion of the dung made on the farm was applied, and it was usual to have it carted out and spread on the wheat stubble in the late autumn or early winter. Usually eighteen to twenty tons of dung was applied in this way. The beans were at one time sown in drills, in order that weeds might be kept down by grubbing between the drills and by hand hoeing and weeding. This system, however, has been almost entirely discarded owing to the scarcity of labour and the greater area of turnips now being sown.

Beans are now, therefore, for the most part, sown broadcast on the top of the winter furrow and ploughed in lightly where the land is of such a nature as will admit of this being done, but on the stiffer clay it is found safer to sow on the top of the second furrow and harrow in the seed. It must be admitted, however, that it is now becoming a common practice to dispense with a second ploughing altogether, and defer the ploughing in of the dung till February or early March. This latter system, whilst minimising labour, entails considerable wastage, due to loss of valuable manurial constituents through the exposure of the dung to the winter snows and rains.

Fully twenty years ago many thoughtful farmers began to consider how far they were justified in applying farmyard dung, rich in nitrogenous matter, to a leguminous crop which did not require nitrogen, or in any case was capable of extracting out of the air such nitrogen as it required. With a view to further elucidate this point, the late Dr Aitken, chemist to the Highland and Agricultural Society, carried out a series of experiments with artificial manures for the bean crop on several farms in the Carse of Stirling in the years 1893-4, for particulars of which see vol. vii. of the Fifth Series, p. 442, of the Society's 'Transactions.' Earlier trials of a similar character are reported upon in the 'Transactions' for 1890, vol. ii., Fifth Series, p. 353. By these experiments it was amply demonstrated that beans could be as successfully grown by the application of a judicious dressing of phosphate and potash as by farmyard manure, and this, too, at greatly less cost. Moreover, the farmer would thus be in a position to apply his farmyard dung more economically and more profitably to his permanent hay crop, which at that period was becoming an important feature in carse farming.

The bean, though an exceedingly hardy plant, is one of the most uncertain crops in the matter of yield the carse farmer raises. He may have a yield of only three quarters per acre,

or in very favourable years from six to eight quarters, and by no skill or foresight on his part can he avert the risk of partial failure. A severe hailstorm, or a night's frost just at the critical point when the bloom is setting, may upset all his calculations; and though there may be an abundance of straw, the yield of grain may be most disappointing, due to the causes referred to. But notwithstanding this uncertainty as to yield, the bean crop forms one of the most valuable and useful in the clay-land rotation. The grain, if well saved, can be relied on to bring a good price. The crop is less liable than cereals to be damaged by bad weather, the fodder is much relished by horses, and the chaff is most useful in the wintering of young stock.

### *Oats.*

Following the sowing of the beans, the carse farmer turns his attention to the sowing of oats, the oats being sown on the land from which ryegrass hay had been cut the previous year. This land had been ploughed in the early part of the winter in order to secure the ameliorating influence of the frost, without which a good seed-bed can rarely be obtained, or indeed a sufficiency of loose soil to adequately cover the seed. The oats should be sown about the middle of March, or as soon as a satisfactory tid can be got.

Where the hay crop had been dressed in the preceding year with nitrate of soda, and two heavy crops of hay had been cut, it is often found necessary and expedient to apply a dressing of artificial manure to the oat crop, either in the shape of a mixture of 2 cwt. of superphosphate and 1 cwt. sulphate of ammonia per acre at the time the oats are sown, or superphosphate only at the time of seed-sowing and a dressing of 1 cwt. nitrate of soda after the plants are braided. Except where the land is in particularly good heart, this outlay for artificial manure will be amply repaid both by a bulkier crop of straw and more abundant yield of grain; and at the same time the land is kept cleaner, which permits, where deemed desirable, of a second crop being taken in the succeeding year of mashlum (beans and oats), thus lengthening the course into a seven instead of a six years' rotation.

### *Barley.*

On the completion of oat-sowing comes the preparation of land for barley. This at one time was a most laborious operation both for man and beast, especially if there had not been during the winter a sufficiency of frost to assist in making the land friable and more easily reduced to a fine tilth. If the preceding

bean crop had been light, the land was invariably foul, and this necessitated two and sometimes three courses of ploughing, with endless intermediate harrowing, brake-harrowing, and rolling. If, unfortunately, wet weather intervened before the barley was sown, a further ploughing became necessary.

During the working of the barley land the horses usually fell off in condition, the collars became too big for their necks, and sore shoulders resulted unless promptly seen to. It was no unusual thing for horses to succumb altogether during this period of hard work, and carse farmers suffered considerable loss in this way.

It was usually well into May before the last of the barley and the grass seeds were sown. The cost of working barley land on carse farms may be put at from £2 to £3 per acre, according to circumstances.

### *Green Crop.*

Attention must now be turned to the preparation of land for green crop. Usually a few potatoes were planted, just sufficient for the domestic use of the farmer and his servants. A small portion of the green-crop break was usually sown with tares for autumn cutting, and the remainder prepared for turnips or left in summer fallow.

The acreage under turnips was often regulated partly by the amount of dung available for that particular crop, but more especially by the weather conditions prevailing at the time, the condition of the land, and the amount of labour and time required to reduce it to the necessarily fine tilth.

The best time to sow turnips on carse land is about the middle of May, and it is not advisable to sow later than the third week of May. It will thus be seen what a precarious crop the turnip is to the carse farmer under these conditions. If the preparation of the barley land is prolonged owing to weather and other conditions, the acreage under turnips is necessarily much curtailed. Thirty to forty years ago the turnip crop did not count for so much in the carse farmer's calculations as it does to-day, as then much fewer stock were kept, often only a few bullocks to trample straw into dung and consume the available turnips. At the best, turnips are always a precarious and uncertain crop on such land, and for one full crop there will be two almost complete failures or partial failures, especially on the stronger clay soils. If the land requires much labour either to reduce it to a fine mould or get it cleared of weeds, it is apt to become so dry during a period of drought that the seed may lie for weeks before germinating, and a very irregular braird results. In order to avoid this

many farmers consider the cleaning of the land as of secondary importance, and that the primary consideration should be to get the seed in before the land gets too dry in order to ensure a good braird, and trust to the horse- and hand-hoe for the eradication of the weeds during summer.

In cases where dung is not too plentiful, a dressing of 15 to 20 tons per acre will suffice. It is preferable to apply the dung in the drills; and it is of the utmost importance that the dung should be short and well rotted, as when it is too dry and improperly rotted the soil is kept too open, and the drought penetrates to the bottom of the drill and seriously imperils the chances of a good braird. In addition to this dressing of dung, an application of 3 cwt. superphosphate and 1 cwt. sulphate of ammonia per acre should be sown in the drills on the top of the dung. This stimulates the plant and enables it to overcome the attack of the turnip-fly. In addition, a small dressing of nitrate of soda, say 1 cwt. per acre, sown between the drills about the end of July or beginning of August, has a most beneficial effect. This should be applied just when the turnips are about to be earthed up, after hoeing is completed. The drilling up in August is of the utmost importance, as it prevents souring of the land during periods of wet weather. The yield of the crop varies according as to whether the season has been favourable or unfavourable. A crop of 20 to 30 tons per acre may be looked for in average years, and in exceptionally suitable seasons as much as 36 tons have been lifted per acre. The root crop from clay land is usually sound and of good quality.

### *Summer Fallow.*

It was long the custom to have about two-thirds (more or less according to circumstances) of the green-crop break summer fallowed. This system of resting and cleaning the land, and exposing it to the action of the sun and the air, had much to commend it in the days when the succeeding wheat crop commanded a price that more than paid two years' rent and the labour bill incurred in the repeated ploughing and harrowing which it was customary to give to fallow land. Fallowing arable land for the purpose of clearing it of weeds and of ameliorating it, or of resting it after a period of severe cropping, is a practice of very ancient origin. In the early history of the Jewish nation we learn that the resting of arable land at stated periods was enjoined by the legislature.

It can well be understood that in the case of clay land continuously under crop a course of summer fallow may have become an absolute necessity in order to keep it free of weeds, but it must at the same time be admitted that it has its draw-

backs, firstly, because the process entails considerable expense without any immediate profit, and secondly, because in districts where there is a considerable rainfall there is apt to be great wastage through the washing of soluble manurial constituents into the drains. In some parts of the country where the land is very highly rented and labour is plentiful, such as in districts where market gardening is pursued and every crop carefully hand-weeded, summer fallowing can be dispensed with.

The cleaning of summer fallow should, if possible, be completed in June, as the work is apt to be retarded, and is seldom so satisfactorily done if left over till July, when thunderstorms are prevalent. After being thoroughly freed of weeds, it is usual to give it two ploughings during the summer months in order to eradicate such weeds as runch or wild mustard, which grow up rapidly from seed which may have been lying dormant in the soil, but which germinates quickly when brought near the surface.

Many years ago it was the prevailing custom to apply to the turnip and fallow land from 4 to 6 tons of slaked lime-shells per acre. In many cases the landlords contributed a portion of the lime applied, in order to encourage improving tenants, but this practice has for the most part been discontinued, and greatly less lime is now being put on the fallow and turnip land. This is largely accounted for by the low prices obtained for farm produce and the increased cost of labour, rendering it unprofitable for farmers to incur the cost unaided. Every practical farmer is fully alive to the beneficial effect of lime on the clay soil, but he also realises that it is possible to over-lime, and that considerably smaller applications at more frequent intervals may be more economical.

The uncertainty of compensation, and the expense incurred in prosecuting claims under the Agricultural Holdings Acts, have also a deterring influence on the putting of capital into the soil, especially on holdings held on short leases.

In some districts gas-lime is pretty freely used on farms which are near to railway stations. This spent lime obtained from gasworks is much cheaper than shell-lime, and is reported to have a very beneficial effect on stiff soils.

### *Laying Land to Grass.*

The low price of grain and the high rate of wages have compelled the carse farmer in recent years to seriously consider how he can reduce the labour bill and change his system to meet the altered conditions in order to get more profit out of his operations, and at the same time keep up the fertility of the land. Consequently we find many up-to-date farmers realising

that land which has been exhausted by long-continued annual cropping can be recruited by being laid down to pasture or hay for two or three years, and then broken up again for cropping when found convenient. It has therefore become the practice in some districts to put through a course of summer fallow as much of the green-crop break as could not be put under turnips, and after being thoroughly cleaned and manured either with farmyard or artificial manure, sow it out with an intermediate or catch crop along with Italian ryegrass and clover, or in some cases timothy with a little Italian ryegrass and clover added, in order to secure a full hay crop the succeeding year.

Where a dairy stock is kept a suitable catch crop may be barley, rape, and Italian ryegrass. This after three months' growth gives a very useful cutting for dairy cows at the time when the pastures are failing. In other cases the necessary grass seeds for a hay crop may be sown along with rape, which can be eaten by sheep in the autumn; but the drawback in this instance is the risk of getting the land poached by the sheep in wet weather, to the detriment of the succeeding hay crop. By adopting either plan, the loss from wastage already referred to when the fallow is left bare till wheat-sowing time is avoided, and some immediate return is obtained to meet the current season's rent and labour accounts.

It has been well said that every addition that can possibly be made to the amount of fodder produced on the farm is, in the present state of British agriculture, of the most material consequence to the farmer. Less ploughing and more feeding should be a guiding principle. The butchers and cattle and sheep dealers, and those engaged in the distribution of perishable farm produce, are better customers than the millers or corn merchants. In the production of grain the farmer has Europe and the vast continent of America with its virgin soils as his rivals, but in the production of milk and the choicest beef or mutton he occupies, or should occupy, a position which gives him a distinct advantage over his rivals in other countries.

### *Hay-making.*

Towards the end of June ryegrass hay-making usually engages attention, if the weather be at all suitable. Some experienced men consider that the proper stage at which to cut hay is just when the plants are in full bloom; others hold that cutting should be delayed for a day or two till the flower has disappeared. It is possible to err by cutting before the crop is sufficiently matured, in which case there is a shrinkage and loss of weight; but it is a still more serious error to delay cutting till the hay is too ripe, as its nutritive properties become impaired.

As a rule, the carse farmer is not so liable to err in this latter respect as his dry-field neighbour, because the aftermath is of greater importance to the former, and he knows from experience that if he allows the first crop to deaden at the roots, the growth of the second crop or aftermath is seriously affected. It is a most fallacious policy, therefore, to allow the first crop to ripen or become too matured, in the mistaken notion that a better bottom growth will be obtained, as a heavy penalty has to be paid for any such increase.

Thanks to the inventive genius and enterprise of the implement manufacturers, the process of hay-making is no longer the laborious process it was fifty years ago. Then the hay crop was all cut with the scythe; and one wonders how it would be possible in these days to revert to the primitive methods of that time with the present-day available labour. It is no uncommon thing to hear elderly men say that the farm labourers of the present time "ken noucht about wark" as compared with a former generation. Cutting a heavy crop of hay with the scythe under a broiling sun from 7 A.M. till 6 P.M. was as heavy work as any man could set face to, particularly to the raw hafin, especially if through lack of skill he did not keep a sharp blade; and it was no uncommon thing for beginners to be barely able to crawl home after the day's work, especially if he had to keep up with matured, experienced scythesmen. By the introduction of the mower, the swathe-turner, the horse-rake, the rick-lifter, and the horse-fork, hay-making has been revolutionised, and the lot of the farm labourer now is as child's play compared with former times, before these labour-saving implements were available. Not only is the work lighter now, but the whole operation is got much more quickly out of hand. In former times the farmers assisted each other with the cutting, and it frequently lasted for weeks; nowadays it is all got over in a few days, if the weather is favourable. The hay, being handled more rapidly, is of better quality, and is more nutritive.

It was no uncommon thing in former times for the hay to lie under the sun for several days until it was deadened, then it was turned by hand and gathered into what was termed wind-rows, then into small coils, and from these into tramp ricks. All the raking was done by hand with hand-rakes. It must be granted that in some respects the work was performed much more tidily and with greater care than now; the coils were neatly put up and trimmed in a way that would resist rain, the hay being for the most part shaken on with the hand. The younger generation of farm servants do not know how to make a tidy rain-resisting coil, and the common practice too often now is to have the hay flung together with forks anyhow, into unshapely heaps, after being gathered into rows by the horse-

rake, and then as speedily as possible put up into what is termed in West Stirlingshire "Buchlyvies,"—a tramp rick containing usually from 60 to 80 stones of hay.

Where a sufficiency of bosses are available, the hay can be put into tramp ricks in a wonderfully green condition. In a fickle climate such as ours it is good policy never to cut more at a time than can be secured the following day, weather permitting. Towards the end of July the hay is fit to be built into stacks, and considerable quantities are often sold out of the tramp rick.

There is no operation on the farm which demands closer attention and better judgment on the part of the farmer than that of hay-making. The weather indications have to be closely studied, and cutting should only be proceeded with when there is a reasonable prospect of getting the hay put up without being saturated with drenching rains. The deadened crop is easily injured by wet when lying in swathe, and if it be subjected for a day or two to alternate sunshine and shower it is depreciated very seriously, both in quality and weight.

When the time for cutting arrives, all the necessary implements and appliances should be seen to and put in good order, so that there may be no delay when the weather is favourable for a start being made. Moderately close cutting is to be commended, but shaving too bare is not desirable, not only because of the injury that may be done to the knives of the mower, but also if cut too close to the earth the plants are longer in commencing to grow a second crop. It is of the utmost importance that the knives should be kept well sharpened, not only on account of the easier draught for the horses, but also because the plants that have been clean cut with a sharp blade will spring more rapidly than those which have been hashed through with a blunt blade.

### *The Timothy Crop.*

With the ryegrass hay safely out of hand, the modern carse farmer is ready to begin the harvesting of the timothy crop, which usually requires a fortnight longer to mature. Here again the right stage for cutting is just when the bloom is going off the plants. If cut before this stage the hay is apt to be tough and wiry, and if the cutting is delayed beyond the right stage the plants become hard and woody in fibre and much of the seed will be lost. Timothy is the most easily secured of all the grasses, and is less liable to injury by rain. Being stronger in the stem, and containing a smaller proportion of leaves, it is much more quickly dried than ordinary hay, and in suitable weather can be got out of hand with very little labour. Where the crop is strong and clean, it can usually in dry weather be

put in ricks of 60 to 80 stones within twenty-four hours of being cut; and if bosses are available, the hay can safely be put up whilst still very green, if nice and dry, and in this way all natural sap is retained in the plant and the fodder is much more nutritious than if the process be prolonged. As in the case of the ryegrass hay, it is never good policy to cut down more timothy in a day than can be satisfactorily handled and secured in rick the succeeding day. This, of course, must be regulated by the number of hands available.

In cases where there is a considerable admixture of clover amongst the timothy, as may be the case in the first year's crop, or where there is soft bottom grass, as in the case of timothy that has been sown out for many years, the process of hay-making is necessarily less rapid, and it may be desirable to put the hay into small coils first, and then into tramp ricks as soon as it is safe to do so. The hay thus secured may be allowed to stand in the fields until it is found convenient to have it put into large stacks or ricks, and the opportunity for this is usually found immediately before harvest.

Properly handled, timothy hay is the best of all fodders, and live stock of all kinds prefer it to any other. There is no crop, if properly treated, that will give a better return, and at less cost, than timothy hay, and it cannot be too strongly impressed on all who are engaged in the cultivation of the carse or strong clay land the great advantage to be obtained from sowing out a section of the farm as a timothy meadow. By doing so the labour bill can be considerably minimised, as even on a moderately sized farm a pair of horses can be dispensed with, and as the timothy is later in maturing than the ryegrass, the labour of the farm is better divided, the making of the ryegrass hay being well out of hand before the timothy hay is ready to cut.

In very exceptional cases as much as 5 tons of timothy hay has been cut per acre, but a really first-class crop would be from 3 to  $3\frac{1}{2}$  tons. The permanence of a timothy meadow entirely depends on the soil and the treatment it receives, but on suitable land well treated it may be counted on to produce a satisfactory crop for six to ten years, and in some cases for a longer period.

Timothy should be liberally top-dressed with farmyard manure either during autumn or preferably in spring, just when growth is about to become active: 20 tons per acre would be a liberal dressing. When the dung is spread, it is a good plan to pass the chain-harrow over it, in order to more equally distribute the manure. Where good farmyard dung is not available, a dressing of 6 to 8 cwt. of slag phosphate and 2 cwt. kainit, or 4 cwt. superphosphate and 2 cwt. kainit, per acre should be applied during winter, and a dressing of either nitrate

of soda or sulphate of ammonia in spring, whichever is found to provide the cheapest supply of nitrogen. About  $1\frac{1}{2}$  cwt. of nitrate, sown the one half about the middle of April and the other during the first week of May, is usually considered ample, though much larger dressings are often applied. In some instances it has been found good practice to apply 1 cwt. sulphate of ammonia early in April, and a slight dressing of nitrate of soda early in May. It always pays to produce a full crop, and the heavier the crop the cleaner the land becomes, as all such weeds as coltsfoot, so troublesome in clay soils, gets effectually choked out.

The benefit accruing from the growing of timothy hay does not end with the abundant crops that are produced, but continues long after the land has been broken up for rotation crops. The deep-rooted plants have permeated down into the subsoil, and fertility has been stored up for subsequent crops. The strong clay has been rendered more friable and open, and an accumulation of humus results from the action of the air on the decaying vegetable matter formed from the network of roots. The land has been rested and renewed, and several successive crops may be grown at little or no cost for manure.

Timothy seed may be sown out, as already described, along with a mixture of Italian ryegrass and clover, on land which has been put through a course of summer fallow in the early spring, or it may be sown out along with a white crop in spring. The advantage of sowing a proportion of Italian ryegrass and clover along with the timothy is to be found in the fuller crop of hay the first year and subsequent aftermath; but there is sometimes a danger of smothering out the timothy plants by the more rapid-growing Italian, and care should be taken to sow only a small proportion of ryegrass,—not more than 8 to 10 lb., and 4 lb. of clover per acre, along with 16 lb. of timothy. Where it is preferred to sow timothy only, from 20 to 24 lb. of seed may be sown, and preferably Scottish seed. There should not be any cocksfoot or other natural grass sown with timothy, as these mature much earlier, and become hard and woody in fibre long ere the timothy is ready to cut.

Another great advantage to the carse farmer in having a section of his farm under timothy lies in the fact that he is able to graze considerable numbers of sheep during the autumn and winter months, which help to pay the rent,—some carse farmers putting this winter grazing alone as worth 15s. to 20s. per acre.

#### *Odd Jobs.*

During the period which usually intervenes between the conclusion of the hay harvest and the commencement of the

grain harvest, the farm hands are employed giving the final furrow to the summer fallow, and grubbing and setting up turnip drills. The natural grass about ditch sides and odd corners is cut and made into hay, ditches are cleaned out, hedges trimmed, roads repaired, stack-bottoms laid, the self-binders and reaping machines got into order, and sundry other odds and ends seen to, preparatory to the serious business of harvest commencing.

### *Grain Harvest.*

Harvest time is the most interesting period of the arable farmer's year,—the time when his hopes are realised or partially disappointed. It is usually in our fickle climate a period of anxiety, as it all depends on the weather whether the fruit of his year's labour will be secured in good condition or greatly injured, as in the disastrous harvests of 1903, 1907, and 1908.

By the genius and enterprise of the inventor the entire process of harvesting the grain crop has been revolutionised. The use of the hook and the scythe have in turn given place to the reaping-machine and self-binder, and, as in the case of the hay-making, the work of the farm labourer under modern conditions is light compared with what it was in former times when the grain was all cut by the hook or sickle. The introduction of the scythe was an undoubted improvement on the hook, and the work of cutting down the crop was more expeditiously carried out than was possible by the more primitive tool.

As has already been indicated, the approach of harvest used to be a period of anxiety for the farmer. Additional labour had to be secured, and where not available in the district, the labourers were usually hired for a period of six weeks and boarded on the farm: a certain number of female workers could in these days be secured locally. There were the scythemen, followed by the lifters, usually females, and coming behind were the binders and stookers, and finally, a lad with a big hand-rake following in the wake of the stookers. The harvesters were usually a merry happy band, and though the work was hard it was carried out cheerfully and light-heartedly. The toil of the lifter was lightened considerably if she were fortunate enough to follow a scytheman who could lay the swathe neatly, and all lying the one way. Occasionally there were jealousies and bickerings among the female workers over their lot in this respect.

Given good weather, a good crop, and efficient workers, the harvest under these conditions was after all a joyous time; but with careless inefficient workers and broken weather, the lot of the farmer was by no means an enviable or easy one, and calculated to sorely try his patience and temper. The period

of harvest usually lasted six weeks, but with broken weather would frequently be extended into eight weeks or longer. The nature of the weather throughout the season has much to do in determining whether the harvest will be late or early, as well as affecting the character of the crop. Between a late and an early harvest there may be a difference of three to four weeks.

In former times, before carse land was as effectively drained as it is now, the harvests were invariably much later, but with good drainage and the more liberal use of artificial manures the crops as a rule in average seasons reach maturity earlier. Then that most useful of nineteenth-century agricultural inventions, the self-binder, dispenses with the necessity for having extra hands, and on most farms the harvest operations are now conducted for the most part without any additional labour. This has brought a happy relief to the mistress of the farmhouse, who in bygone times was often the most harassed and hard-worked person about the farm, as she was generally deprived of her usual help, every available person, male and female, being requisitioned in the harvest-field, and had a greatly augmented extra household to cook, bake, and provide for.

It may be safely computed that in an ordinary year, under modern conditions, the cost of harvesting the crop has been reduced quite one-half, and what is more important still, the time occupied is reduced by quite a half; and where in former times the harvest might extend from six to eight weeks, it may now be completed in from three to four weeks, thus greatly lessening the risk of getting the crop damaged by bad weather. The time occupied, of course, largely depends on the nature of the crop, and whether it is standing well up, so that the binder may cut right round the field, as when only one side can be cut the time occupied is doubled.

The disastrous harvests of 1907 and 1908 will long be remembered as the most costly of recent times, in consequence of the grain being so badly laid and twisted by the stormy weather that in many districts the binder could be little used, and the reaper, and even scythe and hook, had to be called into service to deal with the flattened and twisted crops. In such a fickle climate as ours the prudent farmer will be well advised to make the utmost of his opportunities so long as the ground is dry and the crops standing up, and by changing the horses keep the binder at work till late in the evening, as he knows not what a day or night may bring forth, and how as a result of a storm of rain and wind the expense of harvesting may be doubled or trebled.

Given favourable weather conditions, it is now the practice to cut wheat and oats before the grain is quite dead-ripe, as it has

been demonstrated that a better yield of grain and considerably improved straw results from doing so. The ripening process, if sufficiently advanced before cutting has taken place, is completed in the stook more effectually than was at one time supposed, and the risk of loss from shedding or shaking, as invariably occurs if the grain is allowed to become dead-ripe, is lessened. Oats are particularly liable to loss in this way if allowed to become too ripe, and it is always the plumpest and best matured grains that are most easily shaken off. In the case of oats, therefore, and more especially as regards "Potato" or "Hamilton," or some of the newer varieties, it is especially desirable to err on the side of early cutting rather than to leave the crop till it is quite ripe. Barley, on the other hand, should be allowed to stand till it is fully ripe before being cut if it is intended for malting purposes, and less time will be required for drying the sheaves, and the risk of losing colour from exposure to bad weather will be lessened, the value of barley depending greatly on its colour.

The modern self-binder can now be set to cut much closer to the ground than the original inventions, but in the case of land sown out with grass seeds it is not desirable to cut too low. A longish stubble protects the grasses during winter, while an excess of grass in the bottom of the sheaf hinders the drying operation, and should be avoided as far as possible. The expense of cutting a white crop with the self-binder cannot be definitely computed, as much depends on the condition of the crop and whether it is standing erect, and the state of the land as to its dryness. Under normal conditions a saving of 2s. to 3s. per acre will be effected by using the self-binder instead of the ordinary reaping-machine.

From two to four men are quite sufficient to stook behind a binder, according to circumstances, and the work is always more expeditiously performed if the stokers keep close up to the binder.

The proper sizing of the sheaf is a most important matter. Large sheaves no doubt minimise the labour of handling the crop, but hinder very materially the drying process in the stook. It is therefore desirable to make the sheaves as small as they can be made consistent with the length of the crop, in order to minimise as much as practicable the time required to dry the grain sufficiently to make it safe for stacking. In a short crop with a big undergrowth of grass it is absolutely essential that the sheaves should be made as small as possible. Care should also be taken to have the sheaf tied near the middle, if anything above rather than below, in order to prevent rain finding its way into the centre of the sheaf, as it is very apt to do if the band is tied too near the bottom.

The proper stooking of the sheaves is a matter of considerable importance; and it must be admitted, as in the case of the coiling of the hay, that the younger generation of farm servants are not so expert or methodical in the setting up of the stooks as the older men were. Where the stooking is carelessly performed, much extra labour is entailed in restooking, and it is never so easily done the second time, while besides there is always the risk of getting the blown-down sheaves sodden through with rain. An expert stooker of the old school could so set up his stook that it would withstand any ordinary wind. In setting up a stook, the centre pair of sheaves should always be set up first, and placed as nearly perpendicular as possible. The sheaves should get a firm dump on the ground and have the heads firmly pressed together. Each succeeding pair should be set up at alternate ends of the stook, with their heads pressed together and inclining towards the centre. A much more substantial stook can be set up in this way than where each pair of sheaves are left standing perpendicularly and almost independently of each other. Except in the case of wheat, the number of sheaves in each stook should not exceed eight, and in the case of short grassy grain six will be found ample.

Carting operations are considerably facilitated if the stooks are erected in rows and placed all facing in one direction, preferably south to south-west, or towards the one or two o'clock sun. This facilitates drying, as the prevailing winds strike them on the end and blow right through—and what is of great importance, it enables each side of the stook to get an equal share of the sun.

Long after the introduction of the reaping-machine it was customary to cut the bean crop with the sickle or hook, but gradually that primitive method of harvesting was displaced and the reaping-machine brought into requisition. The bean is usually the last of the grain crop to ripen, and the cutting process was often reserved for frosty mornings, the sheaves being laid aside unbound for several days. It was the common practice to leave the beans lying unbound until the exigency of other work permitted the binding and stooking to be attended to, and no great harm resulted if the sheaves were not left lying too long. The reaping-machine continued to be used for bean-cutting long after the introduction of the self-binder, largely because the binder as originally brought out was not well adapted for bean-cutting. It is found, however, that the more modern machine accomplishes the work quite satisfactorily, and the beans are now stoked straight away as they are cut.

It is not desirable to allow the bean to be too ripe or the

straw too much deadened before cutting takes place, as there is a risk of the pod opening and shedding the grain if subjected to wet weather, the chaff being for the most part lost and the straw less nutritious. Care should therefore be taken to cut just at the stage when the eye of the bean has turned black and the skin has acquired a yellowish colour. The further ripening may be left to take place in the stook.

As a rule, grain grown on carse land gets into suitable condition for stacking somewhat earlier than that grown on dry-field; the straw being stiffer and opener, the drying process is effected more rapidly. The strath embraced in this carse area is also more open and freer from shelter, and the drying, winning winds so necessary to put the grain in good condition are not impeded in the same way as they are on some of the more sheltered dry-field land. Scythe-cut grain usually, under normal weather conditions, was ready for the stack in two days' less time than that cut by the reaper or self-binder, as by the latter process the grain is more firmly packed together. In suitable drying weather wheat can safely be stacked in from four to six days after being cut, oats and barley from eight to ten days, but beans require considerably longer. There is, however, no hard-and-fast rule as to the time required to put the grain in condition to be safely stacked: it all depends on the weather and the state of the ripeness of the grain at the time of cutting. The practical man has no difficulty in satisfying himself whenever he gets his hand into the heart of a sheaf and feels its weight whether it is wonned sufficiently or not. The merely theoretical farmer is too often satisfied if he finds the outside of the sheaf dry and provided it has sat a sufficient number of days in stook. Heating of the stacks almost inevitably results from such haphazard methods.

The writer has in his mind's eye a most worthy man who was more a theorist than a practical farmer, and who invariably, even in the best of seasons, had his grain heated in stack; and on market days, when the keen-scented grain merchants would be sniffing askance at his sample, the farmer would earnestly protest that he couldn't understand how his grain could possibly be heated, as it had stood so many days in the stook.

The ruinously bad harvests of 1903, 1907, and 1908 have driven many thinking men to seriously consider how far they are justified in leaving a valuable crop exposed to the risk of being partially ruined by sitting in stook. Our forefathers, at a period when harvests were usually later than now, adopted a system of "hooding," which means spreading a sheaf on the top of the stook to partially protect it in case of protracted wet weather, but this practice has been almost wholly abandoned.

"Rickling," on the other hand, is being more extensively practised than hitherto. This consists of gathering together ten or twelve stooks and building them up loosely in conical shape, and topping out just like a stack. Grain which is not fit to build in a stack may be temporarily secured in this way. In the case of barley or oats, with which have been sown grass seeds and clovers, this expedient of saving the grain and exposing the grassy bottoms to the drying winds may be highly advantageous in securing not only the grain in good condition, but also in preventing the young grasses from being rotted out, as usually happens when the stooks have to sit for a considerable time. The "rickles" may sit in the fields till sufficiently dried, and may then be carted in to the threshing-machine or built into stacks. "Rickling" is not much practised in carse lands, but has been largely resorted to in some other parts of the country during the past two seasons.

The "Richmond Grain-drying Rack" is another expedient which has much to commend it, but as this method of drying grain has been fully dealt with in a previous volume of the 'Transactions,' it is unnecessary to make more than a passing reference to it in this article. In all sheltered situations and wooded districts a drying-rack should form part of the equipment of every farm. All grain round woods and near hedges, which even in ordinary years is never satisfactorily secured, and in bad years is practically lost, may with the aid of a drying-rack be saved in perfect condition by being put in the rack immediately it is cut, and not stooked at all.

There are other forms of drying-racks now in use. A very simple and serviceable one was invented in 1907 by Messrs M'Ainish & Robertson, Dunkeld, Perthshire. One of the advantages claimed for this form of rack is that it is easily constructed, is not a fixture, and can be set up in the fields where the grain is growing, and then taken down and the material stored away till required in the following season.

### *Stacking of Grain.*

Stacking is a most important part of harvest work, and demands very close attention on the part of the farmer. It is not enough to satisfy himself that the grain is in good order for stacking, but he must see that the stacks are properly built, or very serious loss may result. Grain which in the hands of a skilled stacker may keep splendidly might, if built by an unskilled careless workman, heat and go wrong. The size of the stack must be regulated by the length of the sheaves and the condition of the grain. In a dry climate such as prevails in the Lothians and Forfarshire the stacks may with impunity

be built of considerable dimensions, but in a wet damp climate such as prevails in West Stirlingshire the stacks must be built rather narrow. Indeed, in the case of barley or oats with much grass in the bottom of the sheaves, it is judicious to build the stacks very narrow. By doing so the grain is got earlier into condition for threshing, and a better coloured sample is obtained. In building a stack it is of the utmost importance to keep the heart or centre well packed and the sides quite perpendicular.

The advice given by a road surveyor of a bygone time to one of his surfacemen, who was new to his work, may not be inapplicable to the beginner at stack-building. "Keep it braw and fou and weel roounded in the middle, an' the sides weel redd, and there's nae fear o' ye." A well-built, well-hearted stack will not take in rain even though left unthatched for weeks, but a badly hearted, sluckly built stack may either be liable to heat or take in rain even though promptly thatched.

It is well to have a supply of thatch in readiness, so that on damp mornings, or when unfavourable for further leading-in, the thatching of the stacks already in the stackyard may be proceeded with.

Given favourable weather, a considerable quantity of grain, especially barley, is now threshed out of the stook. This does away with the expense of stacking and thatching, and it is claimed that a more satisfactory yield is obtained.

The horse-rake completes the harvesting operations, and in a dry year the rakings may be threshed and the grain utilised for feeding, but in a bad harvest the rakings are of little value, and may be used for covering turnip-heaps. Ultimately the farm-yard fowls will pick any grain that may still adhere to the straw.

#### *Poultry on Stubbles.*

On some of the best managed farms, where proper attention is being paid to the poultry department, it is now found good practice to have portable poultry-houses in which the fowls can be taken out to the stubble-fields and left for some weeks to clean up all spilt grain, that otherwise would be lost. The poultry benefit immensely from the change to clean ground, and have their constitutions braced up for winter laying.

#### *Autumn Work.*

With the grain crop secure in the stackyard the attention of the farmer is now turned to the preparing of the land for the succeeding year's crop. In exceptionally favourable years, when the harvest is got through early, it is sometimes found

possible to put the bean stubble, or other land showing signs of foulness, through a course of cleaning. The modern cultivator is an implement of great utility for this purpose, and it ought to be gratefully acknowledged that in the matter of tillage implements, as well as of harvesting machinery, the enterprise and inventive genius of the implement manufacturers have given enormous assistance, and has proved potent factors in aiding the carse farmer to hold his own through a period of stress and trial. Ploughs are of lighter draught, and do the work more effectually and speedily. Harrows are lighter and more effective in every way; the clumsy brake-harrows and grubbers of former times are now only to be seen in the farm scrap-heap or at the back of hedges. The modern cultivator is indeed one of the best labour-saving implements introduced to the farm in recent times.

As has been already explained in this article, the carting out of dung and spreading it on the wheat stubble for the succeeding year's crop is usually carried through at intervals during the later stages of the harvest work, or as soon after harvest as possible. Wheat-sowing on the fallow land is also proceeded with as opportunity offers.

#### *Lifting and Storing of Turnips.*

By the end of October and during the first half of November the lifting and storing of the turnip crop engages attention. As before indicated, the turnip is the most uncertain and precarious crop produced on carse land, as well as the most expensive, owing to the enormous labour involved in reducing the land to a proper tilth for the seed. Given a suitable season and a full yield, it is difficult to overestimate its importance. The land has been thoroughly cultivated and cleaned, and a vast amount of nutritious matter has been at the same time produced, which is usually consumed on the farm, and the unappropriated residues are returned to the land. It is therefore of the utmost importance that a crop which has entailed so much expense for labour, and received so much attention during its different stages in order to secure a good yield, should be lifted at the proper time and stored safely, before the alternate frosts and thaws of winter set in.

The carse farmer has not only to see that the turnip crop has attained a proper state of maturity, but it is extremely desirable that the roots should be carted off the land without having it poached, as would inevitably happen during very wet weather, to the great detriment of the succeeding crop. Where it is intended to sow wheat after turnips, the lifting of the root crop is often proceeded with before it has quite attained ma-

turity, especially if the weather is tempting, in order to get a good tid for the wheat. Roots, like fruit, should not be allowed to be too ripe before they are stored; but, on the other hand, if lifted whilst growth is still active, they do not keep so well in the pits or clamps.

In lifting turnips care should be taken not to injure the bulb in removing the top and tails, especially in the case of roots not required for immediate consumption, as the slicing or cutting of the bulb allows the juice to escape, and they do not keep so well. For the same reason turnips should always be thrown into carts by the hands, and not with graips or forks, as they are apt to be punctured. It is well never to store turnips during a period of frost, or great injury and loss may result through wastage in the pit. There is considerable diversity of opinion as to the best method of storing turnips.

Some advocate the forming of small pits in the fields, of from one to two tons, as may be found convenient to fling together without the aid of horses and carts. One obvious advantage of this system is, that the work can be very speedily done, and by dispensing with horses and carts poaching of the land is obviated. The roots can be carted to the steading as required, or when the land is dry enough to admit of this being done without causing damage. Pits of this kind are covered over with a few inches of earth, and it is good policy to place a handful of straw in the apex to act as a ventilator. If stored in good condition turnips keep very well in this way.

Another system recommended, especially for swedes, is that of pulling and placing every two rows of turnips, with tops and tails intact, into a furrow formed by the plough, the roots being covered up with another furrow on the return journey. With a sufficiency of lifters to keep a pair of horses and plough going, this is a very speedy and satisfactory way of storing a crop of swedes, while the roots as a rule keep fresh and juicy, and are often found to have grown in size when taken out in spring.

Neither of these systems, however, appeal to the carse farmer, as, provided the land is in condition to admit of the crop being carted off without doing serious damage, he prefers having the turnips removed from the land and stored in the vicinity of the steading or adjoining roadway, in order that he may get the land ploughed and sown with wheat. In this case either of two methods of storing may be adopted: the roots may be formed into broad flat bings about 3 feet deep and covered over with loose straw, and though the rain may pass freely down through them, the roots will keep quite fresh if stored in good condition. Some think it preferable to form the roots into a

triangular bing running from north to south, 10 feet in width and 4 feet deep at the apex, the turnips being neatly piled up by the hand on the rigging. A bing of this kind could have a spading of earth placed round the base and be covered over with loose straw, or it could be earthened up to within a foot of rigging and straw placed along the top to admit of ventilation.

*Change of System necessitated by Altered Conditions.*

Having dealt with the ordinary routine of the six- or seven-course rotation so long practised by the cultivators of carse land, it might be well to direct attention before concluding this article to the changes and modifications in that routine which entirely altered conditions have made necessary. Improved means of transit and cheapened freights have brought the farmers from the ends of the earth into competition with the British farmer on his own markets. The home farmer, with his highly rented, partially exhausted land, dear labour, and heavy burden of taxation, is engaged in an unequal contest, so far as the production of grain is concerned, compared with his more fortunate rivals, who are cultivating the rich virgin soils in distant lands under sunnier skies and less irksome conditions and burdens. With outside competition becoming keener and keener, labour gradually becoming dearer and scarcer, the carse farmer was driven to reflect how he could modify his system to suit the altered conditions and cut down his working expenses commensurate with the shrinking returns. Hence the tendency to put a section of the farm down to temporary or permanent hay, the simplification of the method of preparing land for barley and the reduction of acreage under summer fallow, the increased production of turnips and keeping more cattle and sheep, and the breeding of young horses.

With the enormous and rapidly increasing motor and electric haulage, and consequent displacement of horse power, which must in turn inevitably lead to a decreased demand for fodder, the arable farmer may in the near future require to consume more of his field products with live stock, and rely more for his income on the production of perishable food-supplies which are now required by our teeming city populations, such as beef, mutton, bacon, milk and its manufactured products, and that not to be despised adjunct of the farm (where well managed), the poultry-yard. It may become necessary to put more clay land down to pasture, which will necessitate on the part of the landlords the provision in many cases of a water-supply and suitable fencing, as much of the carse land is not fenced at all, and in many cases has no available water-supply.

With a view to confirm his own impressions and verify the statements set forth in this article, the writer put himself in communication with six of the more progressive and enterprising farmers engaged in the cultivation of carse land in the Stirling district, and has obtained their permission to make use of replies he received in response to a series of queries which were addressed to them. The correspondents in question are all men of conspicuous ability, skill, and enterprise, of whom it might be said that they have long practised the advice once given to a gathering of agriculturists by the late Lord Salisbury—viz., “That in order to succeed in such a risky and precarious business as that of farming, it was necessary to manure the land with brains.” In the following notes a brief description is given of the system practised by Mr W. T. Malcolm, Dunmore Home Farm, Larbert; Mr James M'Laren, Bandeath, Stirling; Mr James Paterson, Burnbank, Blair Drummond; Mr Andrew Macfarlane, Chalmerston, Blair Drummond; Mr James Gray, Birkenwood, Gargunnoch; and Mr William Hallum, Crawfordston, Kippen.

#### *Rotation of Cropping.*

All are agreed as to the great change that has taken place during the last twenty to thirty years. Mr Malcolm writes: “I found the old rotation or six-course shift too expensive a system for present-day conditions, with scarce and dear labour; too much of the farm was under constant cultivation, and as hay was paying well, I realised the desirability of making a change in my system, and now have always a section of the farm in timothy for at least four years in succession, which I find most advantageous in many ways.”

Mr Paterson writes: “Barley is not keeping its place in the rotation as it did thirty or forty years ago, and the grass seeds are often sown amongst the wheat or succeeding oat crop, and two crops of hay are now taken in succession, the mixture of grass seeds now used being largely timothy, with a little clover to help the first crop. This change in the rotation enables the farmer in many cases to dispense with a pair of horses. The growing of timothy has equalised the labour, as the hay-making with timothy takes place at the slackest time of the year, just preceding by a few weeks the grain harvest.”

Mr Macfarlane says: “There is now no proper rotation followed as compared with thirty to forty years ago, the cost of tillage and other expenses rendering the old system unworkable.”

Mr Gray writes: “Under the old six- or seven-course rotation the land got practically no rest. During the early eighties the price of grain fell to a very low figure, grain-growing became a

very unprofitable business, and the farmer who wished to remain on the land was forced to adopt some less expensive system. This he found in sowing down part of the land in timothy hay and part in temporary or permanent pasture, which enabled him to do with fewer horses and divided the labour of the farm better over the season. This lightened the harvest work very considerably, whilst the land that was rested in hay or pasture did a great deal better when broken up again."

Mr Hallum also strongly approves of having a section of the farm in timothy hay. He usually cuts three crops of hay in succession, and finds that the land thus rested from constant cultivation becomes more fertile and is easier to keep clean, and under this system coltsfoot, which used to be a troublesome weed in carse land, has almost disappeared. The labour is better divided over the year, and the grain harvest much lightened.

Mr M'Laren grows large quantities of timothy hay at Bandeath, and coincides with the views already expressed regarding the advantages of adopting this system of cropping carse land.

### *Barley.*

That barley is losing its place in the rotation seems to be generally conceded. It is not nearly so extensively grown in the Carse of Stirling as hitherto. There is also absolute agreement as to the method of preparing land for barley as compared with former times. Mr Malcolm says that by ploughing lightly in spring, and keeping the fine tilth near the surface, less than half the labour is now required in rolling and harrowing to get the land into good condition for the grass seeds. Mr Gray considers that the method of working barley land has greatly changed within the last thirty years, and the area sown seems to be diminishing each year. Prior to that time any one who did not give his barley land three furrows was considered a poor farmer, but now the approved method seems to be to give the land a good winter furrow, and a light furrow, or what is called skinning, at seed-time. This keeps near the surface the soil which has been pulverised by the winter's frost, and a good mould is thus got for the grass seeds, and the work can be accomplished quickly, which is a great advantage in a bad season.

In former times barley, though sown in the middle of May, could be reckoned on to thresh a fair crop and command a fair price; but now, unless it is sown early, neither a good yield nor a clear sample can be looked for, and there is no market worth having for dark-coloured, light barley.

*Summer Fallow.*

That there is less summer fallowing now, and not the same need for it, as the land gets rested and recruited under timothy hay, seems to be the general opinion. Mr Macfarlane puts the decrease in the acreage under bare fallow at quite one-third. Mr Paterson says that many farmers are now seeding the portion that is bare-fallowed with timothy, with good results; but he foresees a danger ahead in the greatly reduced number of horses used in the large towns and cities, and the yearly increasing acreage put under hay, and thinks the price of hay may become so low that it will be more profitable to feed it to cattle than sell it. Under £3 a ton, hay is better value than cake at present prices.

*Application of Lime.*

Lime is not used to nearly the same extent as thirty to forty years ago. Then it was the practice to apply about six to eight tons of shell-lime per acre to a sixth or seventh of the arable land annually. The general opinion seems to be that tenant farmers are not justified in incurring so much outlay so long as compensation for such improvement is so uncertain. Considerable quantities of gas-lime are used, with good results, in the Kippen and Gargunnoch districts.

*Artificial Manures.*

Artificial manures are much more extensively used now than formerly, especially nitrogenous manures such as sulphate of ammonia and nitrate of soda, which are applied to oats and hay. Basic-slag is also used to a considerable extent in top-dressing ryegrass, timothy hay, and permanent pastures. Superphosphate is used to some extent, principally for the turnip crop, its use as a top-dressing to hay seldom producing any marked result. Potash is seldom used on the clay lands except in an experimental way, and the results so far do not warrant its extensive use.

It is complained that damage by grub is more common than in former times, but this may be due to the absence of lengthened severe frosts during winter.

*Pasture.*

It is estimated that there will now be a sixth more land under pasture than thirty to forty years ago. Mr Paterson thinks there is not nearly the area under pasture that might be, owing to the fields not being fenced and not provided with a water-

supply, and he considers that if more of the carse land were well laid out to permanent pasture it would be well worth the rent that is now being paid for it. He knows from experience in grazing cattle on carse and dry-field pasture that they thrive best on the former. It has been his practice in recent years to divide his one-year-old cattle into two lots, grazing the smaller ones on his carse farm of Stock o' Broom, and the better grown ones on his dry-field farm of Burnbank (both very good farms of their class), and the result has been that at the end of the grazing season there is very little difference between the lots.

*Increase of Live Stock on Carse Farms.*

There is ample evidence of a very marked increase in the number of live stock being kept on carse farms now as compared with former times. Mr Gray writes: "In former times the practice was to keep a couple or so of cows to supply the household and servants with milk, and rear their own calves. At the back end as many bullocks were bought as were necessary to trample the straw into dung in open courts. Dairying was unheard of in those days. Now on the same farms as many as twenty calves will be reared, and these are usually kept on and fattened off as two-year-olds. At one time no carse farmer thought of keeping sheep, but now sheep are largely kept. Some keep breeding ewes and sell fat lambs, others feed cross hogs, whilst others take in sheep to winter."

Mr Paterson is of opinion that with the provision of covered cattle courts, and better accommodation provided for house feeding and wintering, there is a very considerable increase in the number of cattle kept as compared with former times. There is also, he says, a great improvement in the quality of the cattle, and in the care bestowed on the feeding of them. No one, he adds, who has attended the store cattle sales at Stirling for a number of years can fail to notice the gradual and marked improvement in the condition of the cattle consigned by the local farmers. Although there is still room for improvement in some of the lots offered, the greater proportion is highly creditable. While finishing cattle for the butcher is not practised to the same extent on carse farms as on farms where turnips can be more largely grown, still an increasing number of farmers are now finishing their home-bred cattle at one and a half to two years old.

Mr Hallum, in referring to live stock, says: "There is more change in this respect than in any other branch of carse farming. More attention is being paid than formerly to the rearing and feeding of stock of all kinds. Thirty years ago it was

mostly Ayrshire cattle that were reared in the Kippen district; now it is nearly all shorthorn or polled crosses. The number of cattle kept is double what it used to be. There has also been a great increase and improvement in the rearing and breeding of Clydesdale horses."

At Dunmore considerably more cattle and sheep are now being kept owing to so much of the land being under pasture and timothy hay. The hay foggage is grazed by cross lambs, and Mr Malcolm reckons that this alone is worth on an average of years £1 per acre.

Mr Macfarlane considers "that the arable farmer is much safer in these days to go in for mixed farming, and considerably more cattle are now being kept. Shorthorns and shorthorn crosses are found to be more profitable for low-lying lands which are under fifty feet above sea-level than the rather ~~scraggy~~ slow-maturing Ayrshires which were kept on the same land thirty years ago. Horses are also being more extensively reared." Mr Macfarlane concludes his remarks under this head by pointing out that the great drawback to the keeping of more stock on carse land is the want of sufficient housing, fencing, and an adequate water-supply. He also complains of the want of shelter for stock.

The foregoing extracts show how the intelligent carse farmer is gradually changing his system of cultivation and adapting it to meet altered conditions by adopting simpler and less expensive methods of culture, and turning his attention in the direction of producing that which he can place on the market on more equal terms with his colonial and foreign rivals. But the intelligent observer who cares to study the subject cannot fail to realise that more must be done if the home farmer is to hold his own. Every important industry with which he has dealings is highly organised,—he alone remains detached. His home markets are being captured by the organised foreign and colonial farmers, who, by acting in combination, can produce cheaper and can sell cheaper. Agriculture continues to carry on its back quite unnecessary burdens: there are numberless parasites living off it which can quite well be dispensed with. The farmer must get into closer touch with the manufacturer and wholesale merchants in buying the requirements of his farm, and the vast army of middlemen who interpose between the producer and those who are engaged in the distribution of the farmers' produce in the large centres can quite well be greatly reduced in numbers.

Combination alone can effect the cure. The intolerable tyranny to which the northern cattle-feeders are being subjected at the present moment at the hands of organised butchers and

dealers, who are arrogating to themselves the right to dictate to the feeders the terms and conditions on which they must sell their cattle, and demanding that they must be insured against ordinary trade risks, would not have withstood for twenty-four hours the ridicule and contempt which such action merits if only the Scottish farmers had acquired the habit of acting in combination and loyally standing by each other as one man. In this direction lies the solution of the whole problem.

## BEE-KEEPING IN SCOTLAND.

By JAS. HENRY, Brae, Cornhill, Banff.

ALTHOUGH bee-keeping has not hitherto been carried on to a great extent in this country, it has been pursued on intelligent lines by a number of enthusiasts in certain districts. The efforts of these enthusiasts have proved to all who are interested in the welfare of our rural districts that, if undertaken intelligently, bee-keeping is at once fascinating and profitable, and is deserving of every encouragement that can be given to it. It has been shown that the climatic conditions of Scotland, though at times austere and erratic, are on the whole favourable for a flow of honey of premier quality. Nature has endowed the hills and glens of our northern latitudes with a flowering season of a moderately lengthy period, and when the bees of more genial climes have retired from the field, the hardy northerner is reaping the mountains.

Though the climatic conditions, combined with the locality chosen, may stand first as a factor of importance in the production of honey, still, year in and year out, management in the apiary greatly balances their effects. Also it is safe to say that management has more to do with producing a given quantity of honey, even than the number of hives kept. In some years a large quantity of hives will produce a large quantity of honey without much knowledge of a skilled character, but more surplus honey perhaps could be had from skilled management in an apiary containing fewer hives.

That bee-keeping is peculiarly adapted to the conditions which surround life in the country districts is proved by the fact that many who carry it on as a hobby are busy men in almost every one of the many vocations found in rural life.

Reliable figures from records of modern bee-keeping as conducted by these busy bee-keepers show, from a business point of view, that bee-keeping is a profitable undertaking. It is this circumstance, of course, that has most to do with the growing popularity of the industry.

*Profits from Bee-keeping.*

Mr D. M. Macdonald, M.A., Schoolhouse, Morinish, Glenlivet, who has made apiculture a recreative study,—a study peculiarly appropriate for a country schoolmaster,—sums up his experience in these significant words: “A great lover of bees for years made no profit, but as his admiration for the intelligent creatures strengthened, and his knowledge of them increased, he woke up to new and better principles of management, until now his profits will total from £10 to £20 yearly according to the season.”

Another Banffshire bee-keeper increases his income annually by a sum varying from £10 to £50 according to the season, with a general average for more than twenty years of over £25 of clear profit.

One who started quite recently increased his hives from four to eight, and moreover secured a surplus of 430 lb. of honey, which he sold at such a price that he had made £12 to the good.

A working man informed me that his honey paid the rent of his cottage, which is £3, put boots on all the members of his family at a cost of £2, 15s., provided several other small articles costing £1, and left a considerable quantity of honey for home use.

A crofter's wife regularly makes more profit from her beehives than she does from the cattle kept on the croft.

In many parts of Scotland it is almost a proverb that several stocks of bees yield a better and surer profit than a cow and her followers. One local bee-keeper with three hives had a clear profit of £4, 10s. Another with eight hives added £15 to his income; while a third, a day labourer, from five frame hives derived from them in clear cash a sum equal to his wages for a quarter of a year.

It was stated in the ‘Bee Record’ that Mr Andrew Muir, Kirkcowan, had a surplus last season of 2 tons from fifty-nine hives, and in 1905 from a like number he had 3 tons 13 cwt., or a total of 8176 lb. Three of the hives gave him a total of 800 lb. In Ireland the other day Mr J. W. Russell, M.P., gave an instance of a small landowner making £125 from his bees.

The 'Irish Bee Journal' for March instances the case of a farmer in Wexford who, beginning bee-keeping by the discovery of a vagrant swarm which cost him nothing, has so increased his operations as to bring in a handsome profit every year, and last year he marketed 4000 lb. sections of honey from his own hives, making a profit of £100.

Mr F. F. Mackenzie, M.A., Bent Road, Hamilton, furnishes me with useful notes of his own experiences and observation. He says: "No bee-keeper can hope for profit who does not know the life-history and facts of bee life. He might as well hope to grow grain without a knowledge of seasons and manure. I used to make two hives keep a third teeming with bees in a bad season by shifting a brood to the third hive. Profit is hardly possible with straw hives or few hives. Three is a minimum. I always kept one straw hive in order to get swarms to make up the bar-frames if any died in wintering. I used to place one bar-frame above another, killing the queen in the upper hive, and found I got a large yield, as the bees filled the top hive with honey. This was often done in bad seasons. In some years there was no profit. It was then that many amateurs gave up the apiary, forgetting that money spent one year may be returned in later years. There is profit beyond a doubt to one who has a little determination, and who does not give in to a bad season or succession of bad seasons. The following figures are an abstract of the balance-sheets for eight successive years. The five hives can be bought complete for £5, and the swarms can be got for £4, 10s. Apparatus costs £3. No yield of honey perhaps the first year, but after that the figures were as under:—

Number of hives, 5.

Average yield per hive per year in lbs., 48·6.

Average cost for feeding, foundation, &c., per hive per year, 6s. 1d.

Average money return per hive per year, £1, 4s. 3d.

Average profit (not counting time, as much of it would be spare time), 18s. 2d.

Capital (say), £12, 10s.

Profit (say), £4, 14s. 7d."

Mr Moir, station agent, Grange, Banffshire, has also sent me abstracts from his balance-sheets, showing that the strenuous exertions of the long day at a busy junction fulfils the truth of the saying that "busy men find time." He makes all his hives, and, as far as possible, appliances as well. Nothing is allowed in the balance-sheets for labour. In a suitable district he knows of no other hobby that gives such pleasure and is at the same time so profitable as bee-keeping. The following is Mr Moir's balance-sheet for the past eight years:—

Year.	Number of Hives.	Expenditure.			Income.			Home Consumption.		
		£	s.	d.	£	s.	d.	£	s.	d.
1901	2	0	9	10	Nil.			...		
1902	6	7	0	1½	0	10	6	...		
1903	8	6	5	0	6	13	8	...		
1904	13	10	6	1	22	3	9	...		
1905	12	6	15	9	15	12	3	...		
1906	9	6	18	3	26	17	5½	2	0	6
1907	13	14	15	0	18	14	2	1	13	4
1908	13	3	11	0	27	2	9	3	10	8
		56	1	0½	117	14	6½	7	4	6

Total income . . . . . £124 19 0½

Dispenish of all hives, bees, and appliances  
owing to removal . . . . . 29 0 11

£153 19 11½

Total expenditure . . . . . 56 1 0½

Gross profit in eight years . . . . . £97 18 11

It would be a mistake to lead novices to think that these examples are quite common. They only show what can be done. It is, however, quite safe to say that every frame-hive well managed should yield honey equal to a profit of from £1 to £2 yearly.

The labour employed in bee-keeping is usually spare-time labour. There are five months in the year in which the apiary will require little or no time, and during the remaining seven months an average of one hour per week is sufficient to devote to each stock.

Beginners should not choose hives and implements that are complicated and require much time to manipulate. A simple hive will be better so long as it gives the bee-keeper the control over the bees which the gaining of surplus honey entails, and at the same time keeping up the strength and vitality of the colonies.

The whole system of modern bee culture is largely a transgression of nature's laws, or of managing differently from the way the bees would manage if left to their own sweet will. In some things it is advisable to allow nature to have her way, in others it is not; and success is just in proportion as we learn when and where we can, advantageously to a certain extent, cross nature's methods with those devised by man. Drone-traps, queen-traps, queen-excluders, separators, and many other contrivances, are probably not considered "handy" by the bees, but their use is an advantage to the bee-keeper. Beginners

should not attempt new inventions or new methods of which definite conclusions have not been well tested by repeated experiments; the rank and file can well afford to wait until at least good reports are given in regard to a novelty.

### *Honey Imports and Marketing.*

The following figures indicate the imports of honey in the years stated:—

#### SUMMARY FOR 1907.

January . . . .	£811	July . . . .	£3850
February . . . .	573	August . . . .	3153
March . . . .	3923	September . . . .	2658
April . . . .	3645	October . . . .	1793
May . . . .	3302	November . . . .	1826
June . . . .	5454	December . . . .	941
		<hr/>	
Total, 1907 . . . .		£31,929	
		<hr/>	
In 1906 . . . .	£33,897		
„ 1905 . . . .	34,763		
„ 1904 . . . .	29,127		
„ 1903 . . . .	30,349		
„ 1902 . . . .	27,126		
„ 1901 . . . .	42,837		
		<hr/>	
Total, seven years . . . .		£230,028	
		<hr/>	
Average . . . .		£32,861	
		<hr/>	

It is of importance to note in the above summary that the imported article reaches our shores at the same period in which the home article is being manufactured and sold. This fact, combined with the manner in which both home and foreign are placed together on the market, has in a large degree been the means of reducing the price of the home article. Small individual supplies that are soon used up also discourage a trade in which uniformity of supply and uniformity of quality are essential. Much of the imported honey is of doubtful origin and manufacture, but the importer makes up for the inferiority of his article by his aptitude in selling his wares, and derives a handsome return from his business acumen.

At present the best method of marketing the honey from the Scottish bee-keepers' apiaries is the establishing of local or private connections. That the home product is well worth a higher price than the foreign article is apparent, but on the open market the difference between the home and the best imported honey is not sufficiently taken note of by either the large wholesale buyer or the retail trader. Many consumers, indeed, are less careful in this matter than in their own in-

terests they ought to be. Some consideration ought to be given to those who have succeeded in making bee-keeping at home profitable. We should mainly seek to benefit the bee-keeping cottager and the rural artisan, and so make bee-keeping an important rural industry. To the great majority who would benefit in this way, the open market or competition with the foreigner means the reduction of profits to almost the vanishing-point.

But the main factor that has hitherto been against the success of bee-keeping is, that honey has never been produced in sufficient quantities to encourage large buyers to put it on the market as Scottish honey. It is the fact that the heather honey of the Scottish hills is the best in any market, and cannot be imitated, but it is meantime produced in so small a quantity that it is scarcely known beyond the glens in which it is gathered. The formation of numerous bee-keepers' societies, working on co-operative principles, would do much by bringing distant producers into touch with the best honey market in the world. The progress of the industry in Ireland has been greatly facilitated by the work of the Irish Bee-keepers' Association and kindred societies, combined with a scheme by the Department of Agriculture for instruction on apiculture; and there is every reason to hope that when the possibilities of bee-keeping as one of the chief minor industries have been brought home to the minds of the rural dwellers, whose opportunities are second to none in the kingdom, similar, and perhaps greater, results will follow in Scotland.

## FRENCH GARDENING IN ENGLAND.

By WILLIAM E. BEAR, Hailsham.

THE establishment of the system of French gardening in England grew out of the visit of a number of Evesham market-gardeners to inspect the gardens in the neighbourhood of Paris in January 1905. They were much struck with what they saw, and one of the party, Mr Idiens, who was or had been an extensive fruit-grower in the Evesham district, engaged, while in Paris, a French expert for three years, and at once set to work to establish the first French garden in England. After a time this example was followed by two other Evesham men, as well as by a few persons in other parts of England.

If the movement had been left alone, it would have been

extended on its merits, provided that it proved profitable when tried on a small scale. But a section of the press fixed upon it as a subject for sensational and exaggerated writing, and created a craze for the system which, it is to be feared, will result in bitter disappointment and heavy loss to a considerable number of people. Such headings as "Golden" or "Gold-Producing Soil," and notices of gross returns as if they were profits, dazed many readers, and rendered them eager to embark in a venture under which, they fondly supposed, a fortune could be made out of an acre of land.

### *The Paris Gardens.*

What is French gardening? In brief, it is the extension and systematisation of the old-time practice of raising vegetables on hotbeds under glass. The extension, however, covers not only a great multiplication of frames and the introduction of cloches (or bell-glasses), but also a well-planned rotation of crops in each season; while the systematisation improves the details of cultivation in a manner which falls little short of perfection.

Within a few miles of Paris there are thousands of acres of land almost covered with frames and cloches. The gardens are small, few of them being over two acres, and hardly any over three acres, while many are only about half an acre; yet the occupiers are able to pay enormous rents, running up to £40 per acre, and still to get a living and something beyond it, though at the cost of such unremitting toil and attention as might almost be designated as "white slavery."

Prince Kropotkin, in 'Fields, Factories, and Workshops' (Swan, Sonnenschein, & Co., 1901), wrote of the Paris gardener: "He toils, with but a short interruption, from three in the morning till late in the night. He knows no leisure, he has no time to live the life of a human being; the commonwealth does not exist for him, his world is his garden, more than his family."

No doubt this is largely a question of the amount of help which the man has; but apparently the enormous rent renders extreme economy in wages necessary. Seeing that a large proportion of the Paris gardener's produce is exported to Great Britain, it might be supposed that his enterprise could be as well carried on in a rural district near a port where land is comparatively cheap. But the Paris district was chosen in the first instance for two reasons: the first being the excellence of the market for luxuries, and the second the abundance of stable manure to be had at the time for nothing, or next to nothing.

I am informed that the gardeners of that district do not export any of their produce direct to England, but sell it to Paris

salesmen, who ship part of it. Some of the produce is sold by the growers to consumers in Paris. The French gardens, as a rule, are walled in, which partly accounts for the enormous rents; while the highest rents probably are those charged to successors of former gardeners, in consideration of the land being covered to the depth of a foot or more with decayed stable manure. Other additions to capital expenditure influencing rents are those of the water-supply, conducted commonly from raised tanks by means of underground pipes and stand-pipes at convenient distances all over a garden.

The principal crops forced are radishes, lettuces, carrots, and cauliflowers early in the year, and melons and cucumbers later. Turnips, endive, and mustard and cress are also forced early, while less commonly grown are forced asparagus and strawberries.

### *The Paris System.*

Various details of the French garden, its appointments and management, are given in each of two handbooks. The larger and more comprehensive is 'French Gardening,' by T. Newsome (F. Steel & Co., London, 1s.), and the other is 'The French Garden,' by C. D. McKay (Associated Newspapers, Ltd., London, 6d.), which includes a monthly calendar of work. These books contain a great deal of information as to the construction of frames and other requisites, the preparation of manure, times of sowing, varieties of plants, the arrangement of frames and cloches, and the treatment of growing crops.

But the best consecutive account of the Paris system that I have seen is that which was given by Mr Walter F. Giles, a representative of Messrs Sutton & Sons of Reading, in a paper read by him last autumn before the Alton Horticultural Society, and this may be summarised briefly.

All through the summer stable manure is collected, and stored up in large heaps to ferment and rot. In making up the beds in November, some fresh manure is mixed with the older portion. The beds are made a little wider than frames which are about 13 feet by  $4\frac{1}{2}$  feet, and there is a narrow path, about 1 foot wide, between each two rows of frames. A frame is about 9 inches deep at the back and 7 inches at the front, the slope being very slight. Each frame contains three lights, which always lift up, as there is no room for them to slide. After the manure is put into the frames it is trodden down, and 3 or 4 inches of good soil are placed upon it, after which the beds are left to settle down. The soil comes within 4 or 5 inches of the glass, a point of importance for preventing plants from being drawn up in lanky form.

When the temperature in the frames has dropped to be-

tween 50 and 60 degrees, radish and carrot seeds are sown very thinly, and lettuce and cauliflower plants, previously raised, are transplanted among them. In order to maintain the heat in cold weather, it is necessary to place a lining of fresh manure around each frame, covering the space outside it nearly up to the level of the lights.

When the cloches are to be used for raising seedlings, they are placed closely together over spent hotbeds or rich borders, seeds being sown under them, after which, in cold weather, they are covered with the rye-straw mats used very extensively in French gardens. When they are to be used on hotbeds, the whole of each bed is sown with radish and carrot seeds, and then the cloches are placed upon it in such a way as to economise space to the utmost. Lettuces are then planted under the cloches, and in the triangular space between each three of them.

When the lettuces under the cloches have been cut, the cloches are shifted to cover those which had been growing slowly in the outside spaces. The radishes before this time will have been cleared off; and when the lettuces have also been marketed, cauliflowers are planted out among the carrots, one under each cloche, and others around the edges of the beds. After all the crops of the first set have been cleared off, the beds are sown afresh with radishes, carrots, endive, spinach, or other vegetables for which there is a demand.

In watering it is not necessary to move the cloches, as the water readily finds its way underneath their rims. Other uses for the cloches are those of placing them over tomato plants in the open till danger of frost is past, and over strawberry plants in pots when the fruit begins to swell.

Lettuce seed is first sown in October under cloches as described, and in about three weeks the seedlings should be large enough to be pricked out under other cloches, where they can remain until they are finally transplanted somewhat thinly in frames, or under cloches on hotbeds in December among carrots and radishes already sown. As soon as the radishes have been pulled and the carrots thinned, a few cauliflowers can be planted in each frame and one in each cloche.

In time the lettuces will be cut and the carrots pulled, leaving plenty of space for the cauliflowers to mature in. Careful daily attention is needed to pick off all decaying leaves of lettuces, and to give just enough ventilation to prevent the plants from damping off, while the rye-straw mats must be placed over the frames and cloches at night in cold weather. As already stated, moreover, the outsides of the frames should be lined with fresh stable manure to keep up the heat. No other than horse manure, it may here be remarked, is suitable

for a French garden, although leaf-mould is occasionally mixed with it in working hotbeds.

The earliest radishes are usually sown in November, and are ready for market in about six weeks. Only shot-topped forcing varieties are suitable. Carrots also are sown in November. Cauliflowers are sown for the earliest crop in October under cloches on spent hotbeds or warm borders, as lettuces are, being pricked out when small under other cloches, and finally transferred to the hotbeds in January or February. They require as much air in the daytime as can be allowed without injuring other crops grown with them. Later sowings can be made in heat in December and January from a succession, and finally some are grown out of cover. Turnips are usually sown on the hotbeds in January, though occasionally earlier. They require to be thinned early, and they need plenty of air. When sown in January they should be fit for pulling in April.

Melons and cucumber seeds are sown on hotbeds, commonly in pots, in January or early in February, and the plants are pricked out into other pots afterwards, and in March transplanted into frames or under cloches, one plant to a cloche. If they are planted in hotbeds which have grown lettuces or other crops earlier in the season, lining with fresh manure is necessary. The utmost care and attention are necessary in relation to temperature, ventilation, and protection from frost in the culture of these crops when they are forced early. The details are too voluminous to be given in this article. Only the Cantaloupe melon is grown in the French market-gardens.

Tomatoes are less grown in the gardens under notice than they were when competition from Algeria and the Canary Islands had not begun. The seeds are sown in slight heat in January and February, and the plants are set out as soon as they are large enough. Two stems are usually allowed to a plant, and these are trained across just under the lights.

In forcing asparagus hotbeds are made up in October and November, five or six inches of soil being placed over the manure. Three-year-old plants are then packed closely on the top, and more soil is placed over them. The lights are not put on till the heat has moderated, in about a fortnight. As soon as the shoots show, more soil is placed over them, and about a month later cutting is begun.

Experiments have been made and are being continued in heating soil by means of hot water in underground pipes, instead of by means of manure. At present it remains to be proved whether this method of heating will prove superior to the old one, due regard being paid to expenses as well as efficiency. For forcing sea-kale this hot-water pipe system has long been used by a few growers in England.

It must not be supposed that French gardens are entirely covered with frames and cloches. On the contrary, as a rule considerable portions of them are devoted to the open-air culture of crops to develop comparatively late in the season. But these portions are covered with rotten manure and earth from old hotbeds, often a foot or more in thickness, so that very heavy outdoor crops of fine quality are produced in the sheltered (walled-in) gardens.

Even from the summary of the Paris system of gardening given above, it will be seen that it is one involving much labour and incessant attention; but to show this fully the complete details of the culture of the crops are necessary. One heavy item of labour in the Paris gardens may be, and is being, greatly reduced in English gardens of the same class. It has been stated that, in order to economise space in the extremely high-rented Paris gardens, only very narrow paths are left between the rows of frames and groups of cloches. Consequently all the manure has to be carried on men's backs in tall baskets made for the purpose. Where land is not one-tenth as valuable, space can be allowed for barrows or even for light tramways, and is being allowed in some of the few gardens already in operation in England. In some cases in France, too, all the watering is done by pots, involving an enormous waste of labour.

There appears to be no doubt, however, that the Paris gardeners have been fairly repaid for their arduous work and attention in the past, however much their profits may be reduced hereafter by British competition. One authority states that replies from some of these men lead to the conclusion that their average gross returns are about £500 per acre, out of which they expect £60 of net profit after paying all expenses and providing maintenance for their families. But whether these returns and profits relate to whole gardens, or only to the portions covered by glass, is uncertain.

### *The Adoption of the System in England.*

Mr Giles points out in his paper that the attention of British horticulturists was drawn to the French system very many years ago, particularly in reference to the use of cloches, some of which came into use in this country at the time. Moreover, as long ago as 1869 a book was published in which the French system was described, and in which British gardeners were advised to adopt it. The impression was, however, that our climate was not suitable to it. This the Evesham visitors to Paris soon concluded to be an erroneous supposition. They noticed that cabbages in the open around Paris were less advanced than at Evesham, and they returned to England with

the conviction that the climate in many parts of their own country was superior for gardening purposes to that of the Paris district. The only difficulty which they apprehended was that of obtaining the large quantity of stable manure required at a sufficiently low price.

Mr Idiens set apart a piece of land five acres in extent on the banks of the Avon at Bengeworth, near Evesham, using three-quarters of an acre of it as a French garden in the March following the visit to Paris. The undertaking is now in the hands of Mr Harvey, and by the spring of 1908 more than half the area of the piece of land was covered with frames and cloches. In September of the same year a representative of the 'Fruit Grower' (London) visited the garden, and reported the results of his visit in that paper of September 17, in which an illustration shows the admirable arrangement of the frames and cloches.

Four acres were then under work in the proper rotation for French gardening, though not all under glass. There were 500 frames with three lights each and from 9000 to 10,000 cloches. The whole of the four acres was supplied with water pumped up from the Avon by means of a petroleum-engine, and carried through underground mains, with which stand-pipes presumably are connected.

The garden, too, is intersected by a light tramway, from which, by means of turn-tables and curves, manure in a trolley containing 15 cwt. can be carried on temporary tramways and laid down in a few minutes along any of the sufficiently wide pathways between sets of frames or cloches. This system of tramways is more fully described, with the help of diagrams, in Mr Newsome's handbook already mentioned.

Mr Harvey informed the representative of the 'Fruit Grower' that without this system he thought the garden would not have paid. From 900 to 1000 tons of manure were used in 1908, though it is not clear whether this was spread over the entire four acres used as a French garden, including the uncovered portion, or only where hotbeds were formed, on from  $2\frac{1}{2}$  acres or a little more. According to Mr Newsome, fresh stable manure costs 5s. 10d. per ton delivered at Evesham station.

The French expert's services had been dispensed with on the termination of his three years' engagement, and the garden was worked by four men regularly, and six in the busy season, possibly with some help from Mr Harvey.

The crops mentioned as having been grown in the season are lettuces, carrots, cauliflowers, melons, cucumbers, strawberries, and tomatoes. The tomatoes, an outdoor crop of one acre, were raised and protected, no doubt, under glass, while the

later portion of the fruit was gathered and laid on straw in frames to ripen.

In reply to the question whether he found the garden an El Dorado, Mr Harvey said: "No; certainly not. It requires large capital and a large turnover, and it pays just about the same as any other branch of market gardening." He added that extravagant statements, which he never made, had been attributed to him by certain writers. Visitors asked about the value of the contents of a frame of melons, for example, received an answer, and then made a large use of the multiplication table and their imagination. A more common cause, perhaps, of the gross exaggerations which have appeared in print is that of taking the gross returns of the portion of a garden covered with glass and assuming that the whole area, including some necessarily waste space and the portion needed for open-air crops, gave the same return; further, imagining that at least half of the returns would be net profit. The resources of the system could not be used to the greatest advantage without space for open-air crops of late produce, best grown, or at least finished, in the open, which, while giving a vastly smaller return in money, are produced at perhaps one-sixth of the expense. There are, I believe, two French gardens at Evesham much smaller than Mr Harvey's.

Following the establishment of the first French garden in the Evesham district was that of a garden at Mayland, in Essex, in 1907, on the property of Mr Fels, but under the management of Mr Thomas Smith and a French expert. Some details, based upon Mr Smith's experience, will be given further on in this article.

In November 1907 a garden of the same description was started at Thatcham, Berkshire, by two young ladies who had been students at Lady Warwick's Gardening College at Studley, Warwick, assisted by a French expert. The land acquired for this garden, a good light loam over gravel, is five acres in extent, and a start was made with three-quarters of an acre, fenced in with corrugated iron, since extended to over two acres. Pupils are taken, and at the present time there are eighteen, ladies only being received. Visitors presented themselves in 1908 in such embarrassing number that it was decided to charge a guinea for a visit, and this checked the influx without stopping it entirely. At the present time four acres are under cultivation, and 270 frames with three lights each and 3000 cloches are in use.

### *A Visit to a French Garden.*

Two or three small French gardens have also been started at or near Tiptree in Essex, in at least one of which a French

expert is engaged. The only other French gardens in England brought to my notice, although there may be a few others unknown to fame at present, are the one at Brighton, recently visited by the King, and one started last October by Miss Kingcome at Westfield, Sussex, four miles alike from Battle and from Hastings, which I visited on the 9th of February.

The Westfield garden is an acre and a quarter in extent, with land on one side of it available for its extension. The soil is a free-working loam over clay, and the ground slopes to the south. More suitable soil for the purpose could hardly be desired, while the aspect is perfect. One side of the garden is fenced in with corrugated iron, and the other sides have natural hedges; but it is impossible to shelter against the south-western gales, the prevailing gales of the south coast, and this may be regarded as the only disadvantage of the site, unless the necessity of having all manure carted from Hastings, at the cost of 7s. 6d. per ton delivered, may be added.

A raised tank, into which water is pumped from a well by a small steam-engine, supplies stand-pipes at convenient distances all over the garden, and it will be easy to run a heating-pipe through the water in the tank to take the chill off in cold weather. Frames and cloches were placed or being got ready to cover one acre at the time of my visit. The boxes of the frames are made on the place, and the woodwork of the lights and the glass are obtained separately, the glazing being done in the garden. The cloches have been imported from France. They are composed of glass of a blue tinge, and are preferred on that account to the English white glass. The cost was 1s. 8d. each delivered, which seems an inordinately high price, as one buyer informs me that they can be bought in France at 10d. each. There is a pathway two feet wide, which is double the width common where space is very precious, to each row of frames and to each three rows of cloches.

At the time of my visit, the French expert was lining the sides of frames with fresh manure, to preserve the heat of the hotbeds. The frames contained carrots, with lettuces planted out among them, while some of the cloches contained transplanted lettuces, and others had lettuces or cauliflowers sown under them. The number of lettuces planted in a frame or a cloche varies with the period of the season. Turnips are also grown to some extent, while melons, cucumbers, strawberries, and tomatoes are later crops.

No definite idea of the financial prospects of the venture can be formed at present; but Miss Kingcome estimates that a capital of fully £700 per acre is required to carry her through the first year. Local seaside towns are expected to be good markets for some of the produce, while special arrangements

will allow of the disposal of some in large-consuming establishments in London.

Extra labour has been needed in preparing the land, which was under grass when taken; but it is expected that one man, in addition to the French expert and the pupils, will suffice when the preliminary work has been finished. It is worth while to notice that, in trenching the land, the turf was buried in part of the garden; but the result was so bad an attack of wireworm on the young plants, that it was decided to take off the turf and sell it from the rest of the area. Seeing that all the surface will be covered with manure to a considerable thickness in a year or two, the loss of the turf is not regarded as important. Where the turf has been removed there is no trouble from the wireworm.

### *How to start a French Garden.*

By far the most complete practical directions for starting a French garden in this country that I have seen are those given by Mr Thomas Smith, based on his experience at Mayland, Essex, in a paper read at Loughton on October 29, 1908, which was given in the four consecutive issues of the 'Fruit Grower' (Salisbury Court, London, E.C.) ending with that of November 26. These numbers can be obtained by post for 6d., so long as there are any in stock; but the principal points are summarised below.

In the first place, Mr Smith gives a useful warning against any attempt to undertake the industry without experience. As he says, the work is simple, but easy only to those who know how to do it. He recommends starting on a very small scale, until experience has been gained; but even so, it may be suggested, a grower might never get into the best system, and, unless a French expert is to be employed at a cost of about £150 per annum, or one of the English experts trained where pupils are taken, at least a year should be spent as a pupil in an established French garden before any one starts on his or her own account.

The ideal place for a start is where stable manure can be obtained cheaply, and in the neighbourhood of a large-consuming population. Rent, Mr Smith says, is a secondary consideration; but it seems to me that the land should be purchased, even if it has to be mortgaged to the utmost. The land should be drained, if it is at all wet. A good friable loam is to be preferred, because it gives great advantages in the early years of the undertaking, though the quality of the soil is not a great consideration after it has been thickly covered with manure. The ground should be nearly level, or sloping towards

the south, south-east, or south-west. Shelter from cold wind is necessary, and yet contiguity to high buildings or trees which would obstruct sunshine and air should be avoided. A good water-supply is essential, and it should be distributed by underground pipes with which stand-pipes are connected, so that every part of the garden can be reached by a hose-pipe.

For a garden of half an acre a start may be made with 33 frames of 3 lights each and 850 cloches, when economy of expenditure is necessary. Everything should be planned out on a precise system from the beginning. Suppose, for example, that the plot of land is 234 feet from east to west, and 93 feet from north to south. Surrounding the plot is a fence 6 feet high. In the north-west corner is a shed 15 feet long and 10 feet wide. A space of 83 feet by 15 feet immediately in front of the shed is required for stacking manure and other purposes. On three sides, under the shelter of the fence, is a hotbed 12 feet wide, to be used permanently for open-air crops, a path 5 feet wide being left next to it. The centre of the garden is then divided into six sections of 65 feet by 30 feet, with a 3-foot path between each two sections, and the whole of them will accommodate 30 frames and 810 cloches.

When the garden is in working order, one section will be covered with frames on hotbeds, two will be devoted to outdoor crops, and two prepared for melons and cucumbers.

When the planning has been done, the fence erected, and the water arrangements completed, begin to get in the manure. Apart from what will be needed for hotbeds later on, a supply of rotten manure for open-ground crops, at the rate of 50 tons per acre, should be accumulated before September, when the sowing of seeds will commence. Before that month, too, the land should all be bastard-trenched, half the manure being covered by the top spit during that operation, and half worked into the surface afterwards. All perennial weeds should be taken out, and the surface of the soil broken up finely.

For making beds for seed-sowing and pricking out young seedlings, as well as for covering hotbeds, some thoroughly decayed stable manure is needed to be mixed with half its bulk of good soil and sifted. After the first season the spent manure of old hotbeds, without any earth, will give the best results.

In September, the beginning of the French garden season, fresh stable manure should be obtained and placed in high heaps to keep and sweeten preparatory to its use for making hotbeds in January, with fresh manure in addition. The sowing of seeds (apart from spring cabbages for the open ground, sown much earlier, but hardly counting as a section of French gardening specially) begins with cauliflower seed in the middle of September. A piece of ground prepared and manured as described

above is raked, and prepared compost, as also described, to the depth of two inches, is placed on the top and well levelled. Then the seed is sown thinly and evenly, covered with half an inch of compost, and pressed down with a tool consisting of a flat piece of hard wood, 18 inches by 9 inches and 1 inch thick, to the centre of which a long handle is attached. It is surprising to find a thorough watering through a fine rose recommended immediately, as gardeners usually prefer to water the soil, if not moist enough, before sowing and covering the seed. To keep off the "fly," frequent waterings will be needed after the plants show above ground.

By the middle of October the seedlings are ready to be pricked out into their winter quarters under frames. Inside the frames prepared, compost of earth and rotten manure is placed 3 inches deep, levelled, and pressed. Then the cauliflower plants are set 3 inches apart, no watering being desirable unless the soil is dry, and then only enough to start the plants. No water should be given during the winter, the soil and air being damp enough.

A second lot of cauliflower seed should be sown in October, and set out in frames in November, for the earliest outdoor crop. In both cases the frames should be partially opened whenever the weather is mild, but closed and covered with mats when there is any frost or rough weather. From October 4 to 10 sow both hardy and forcing cabbage lettuce and cos lettuce. A bed should be prepared as directed for cauliflowers, and wide enough for two rows of cloches, which are set on the bed almost touching, lightly pressed down, and then taken off, the seed being sown thinly in the circular space marked by them, after which they are replaced. In sunny weather shading with mats is necessary for three or four hours in the middle of the day. As soon as the seedlings are big enough to handle, they should be pricked out on a similar bed under cloches, thirty plants to each.

The forcing cabbage lettuces remain under the cloches through the winter without air; but the hardy cabbage and cos varieties require to have fresh air supplied whenever the weather is mild, by tilting the cloches by means of a notched piece of wood, so that the open side is away from the wind. The cos lettuces require transplanting three or four times, the number to a cloche being reduced at each transplanting until there are only six at the end. All weak plants should be thrown away when transplanting is done, and decayed leaves removed. The greatest care is needed during the winter to prevent damage from frost on the one hand and damping-off on the other. In severe weather dry litter is spread among the cloches, but is removed when a mild spell occurs; while at all times, when frost is

likely to occur at night, mats are placed over the cloches. But, short of allowing the plants to be frosted, it is desirable to keep them as hardy as possible, the mats being removed in the mild part of each day.

In the middle of January preparation is made for starting the hotbeds. Manure half-fresh and half-decayed is laid down 18 inches in depth, and in width enough to extend 9 inches outside the frames, levelling the manure and beating it down with the back of a fork. Then set on the row of manure a row of frames touching each other. Put a little manure inside each frame and fill with prepared soil to within two inches of the top board, levelling it and taking out lumps. Then at once put on the lights, and cover with rye-straw mats. The next row of frames should be 10 inches from the first. In two or three days after covering the beds will be warm, and French breakfast or some other forcing radish should be sown thinly, also French forcing carrot, the seed being covered with fine dry compost and pressed down evenly and firmly. Next take forcing cabbage lettuces from under the cloches and set them all over these beds sown with radish seed, 9 inches apart, closing the frames and covering with mats at night, but removing them early in the morning unless frost prevails. When the radishes are up they require air; but too much will be bad for the lettuces.

Finally, fill the spaces between the rows of frames with fresh manure to preserve the heat, renewing these linings if the beds cool too rapidly. No watering shall be necessary at this winter period of the year. The radishes should be ready in the fourth week from the one in which they were sown, and the lettuces in five or six weeks after their planting. The carrots will then be coming up. After removing all lettuce roots, plant four cauliflowers to each light (twelve to a frame), water thoroughly, and keep close for a few days, afterwards giving plenty of air as well as water, gradually increasing the airing until the lights can be fully raised. Finally, by the end of April remove the frames and take them to the cucumber and melon sections.

The carrots should be ready for market by the end of April, and the cauliflowers early in June. After all are gone, the bed is to be forked over and planted with such open-air crops as are desired, such as celery, endive, spinach, lettuces, or radishes. Such crops bring the season for this section to an end.

The hotbed for cloches is prepared early in February in the same way as directed for frames. The manure is covered with 2 inches of prepared soil, and the cloches are placed about an inch apart in beds of three rows each, so that those in the middle row are opposite to those in each outside row, a space of 12 inches being left between each bed and the next. In the

centre of each a cos lettuce is planted, with three forcing cabbage lettuces around it at equal distances. The soil is pressed down with the foot on one side of each cloche, and this gives as much air as is necessary or safe until the weather becomes mild, after which as much air and water are given as appear desirable. In each of the triangular spaces left on the beds by arranging the cloches as directed, a cos lettuce is planted. Cover the beds with mats when frost occurs. When the covered cabbage lettuces first and the cos lettuces shortly afterwards have been marketed, the cloches are shifted over the cos lettuces in the triangular spaces, and a cauliflower is planted where each covered cos lettuce stood, now an open part of the bed.

These crops should be cleared off by the end of June, and then the bed is treated for open-air crops as directed for the frame-bed, the cloches being shifted to the melon and cucumber section.

Hardy cabbage lettuces are planted 10 inches apart in the open ground early in February, and spare cos lettuces at the beginning of March, 12 inches apart or 15 inches, with cabbage lettuces between them. The second batch of open-air cauliflowers is set out at the end of March at distances varying with the crops, such as spinach, lettuce, or radish, grown between them. Endive for an early crop is sown on a hotbed in March, pricked out on a similar bed, and planted finally in a cold frame. Successive lots are sown up to August 15. Celery plants are raised on cool beds in frames or cloches, and set out on the flat 14 inches apart. The earliest batch is bleached by covering it all over with mats. The later lot is lifted and set as closely as the plants will stand in frames, the lights being kept raised, and covered with mats to bleach the plants. Turnips are usually grown as a change from carrots, and when they are grown in frames the seed is not sown until the lettuces are gone.

Melons and cucumbers, which are among the principal crops of a French garden, are grown similarly, except that the former need more air and less water than the latter. The first lot of seed is sown on a thick hotbed at the beginning of April. Seedling melons are placed in No. 60 pots as soon as they show two good leaves, the pots being plunged in the bed. Tepid water is sparingly used for them. Before they are ready for planting out, a trench 2 feet wide and one spit deep is dug out where a row of frames is to stand, and filled with good hot manure, which is brought over the sides of the trench to cover all the ground within the frame 4 inches deep. In digging the second trench the soil is thrown on top of the manure in the first, and so on as other trenches are dug. Two holes are

made close to each other in this rough soil near the centre of each light, and filled with compost. In these, melons, each with two shoots, are planted, one shoot being trained towards the top and the other towards the bottom of the frame.

The frames are kept closed for a few days, and mats are put on them at night. Shading from hot sunshine is given when necessary. When the plants have started they need a good soaking with water and a little air, the latter being increased as the weather permits. The culture of cucumbers is assumed to be known so well that directions are not given. If large melons are wanted, only one to each plant should be grown, and in no case more than two. As soon as the melons are three-quarters grown, four cauliflowers to each light may be planted, to be well watered after the melons are gone. Only the Cantaloupe, or "rock melon," is grown. The last batch of melons is set out not later than May 20, and may be placed singly under cloches, the shoots being allowed to run outside.

Mr Smith mentions other crops, such as strawberries, asparagus, dwarf beans, and tomatoes, but does not describe their culture.

#### *Financial Prospects.*

There appears to be no reason why French gardening should not pay fairly in many parts of England and the mildest districts of Scotland, provided that it is not overdone. British producers will have great advantages over the Paris gardeners in rents or purchased land, conveyance of produce to market, and its freshness when it reaches markets. It is stated, too, that damping-off is less common in the English gardens started than in the Paris district. But a great number of pupils will have been trained in the course of two or three years, and if they all start French gardens on their own account, or manage them for other persons, the production of early vegetables may be so great as to bring prices down to an unremunerative level.

The capital required per acre depends largely upon the cost or rent of land and the extent to which outlay is economised by making frames (not the woodwork of the lights) at home, and possibly straw mats also. For the half-acre garden, the culture of which he describes, Mr Smith gives items of expenditure for the first year which, with £75 for one man in addition to the occupier and a woman in the packing season, amount to £325, the land being rented. This would be £650 per acre. But he also states in another part of his paper that where everything has to be provided the expenditure in the first year will be "somewhere near £1000" for a well-appointed garden. This, presumably, is where frames as well as mats are bought ready-made. Both can be made at home at a considerable saving,

excepting the woodwork of the lights, which is best purchased complete, while the glass can be bought separately and put into the woodwork with putty.

Mr Newsome in his handbook gives instructions for making both frames and mats. Yet he makes the first year's expenses on one acre, when a French expert is employed at £150 per annum, and three other men at £1 per week, "at least £1600," and puts the return at £600 to £700. He allows no less than £240 for manure. Of course, a great deal depends upon the proportion of the acre covered with glass, the cost per ton of the manure, the value of land, the rate of wages, and other details. After the first year he thinks that the expense would drop to £200 per acre, while the returns would increase; but in this £200 he does not allow anything for railway carriage and salesmen's commissions.

To return to Mr Smith's reckoning, which is based upon half an acre, covered or uncovered, in the definite proportions stated. His items apart from labour are as follows:—

Packing shed	.	.	.	.	.	£15
Fence	.	.	.	.	.	30
Thirty frames	.	.	.	.	.	60
850 cloches	.	.	.	.	.	45
Sundry tools	.	.	.	.	.	10
Seeds	.	.	.	.	.	2
Installation of water-pipes	.	.	.	.	.	30
Rent, rates, and water	.	.	.	.	.	10
Manure, 192 tons at 5s.	.	.	.	.	.	48
Total	.	.	.	.	.	£250

To this must be added the wages of one man regularly and one woman in the busy seasons, put at £75, making £325 as already stated, or at the rate of £650 per acre. It is not clear why water should be charged, and without it the allowance for rent and rates is much too high, even for land near a town. On the other hand, 5s. per ton for manure delivered is too little, and there is no charge for mats.

The gross returns of a well-managed garden of half an acre Mr Smith puts at £300, and, after the third year, when the cost of manure would be reduced, he thinks that the total expenditure, including wages, would be about £195, leaving £105 for the working occupier.

This seems a handsome sum to be earned from half an acre of land; but it is not much for covering interest on a capital of even £300, and the payment to the occupier for arduous work and almost constant attention. The man could take a dairy farm of 40 acres with the same amount of capital, and probably could obtain at least as much profit with a tenth of the worry.

Bearing in mind the fact that the account is that of a garden started as economically as possible, and managed by a man who is his own expert, and considering the risk of falling prices for early forced vegetables or loss from mistakes in management or exceptionally bad seasons, the outlook for French gardening is not represented as a strikingly brilliant one.

One serious risk, at any rate, may be avoided—namely, that which is incidental to the hiring of land in which £600 to £1000 per acre will be invested. Even a long lease would not be sufficient security without a covenant entitling the tenant to compensation for the great accumulation of manure on the land, or to the right of selling his tenancy with his frames, cloches, and fixtures. As for a yearly tenancy, with nothing beyond the Market Gardeners Act as security, and with the risk of being evicted at a year's notice or of having his rent raised enormously, as that of the Paris gardener has been, it seems imprudent in the highest degree for any man to start French gardening under such conditions. Small as the area of land required for even a great business in French gardening is, it should surely be purchased.

## NEW NITROGENOUS MANURES.

By JAMES HENDRICK, B.Sc., F.I.C., (Chemist to the Society.

SINCE chemistry became a science in its modern sense, and since chemists were able to resolve matter into the principal elements which we now know, one of the great problems which has constantly in one form or another occupied attention has been that of the origin and formation of the compounds of the element nitrogen. Nearly all great chemists up to the time of Liebig paid some attention to this fundamental problem. After the middle of the nineteenth century the rapid growth of organic chemistry for a time turned the attention of chemists to the development of that great branch of the science. The older chemists were able to combine pure chemistry, inorganic and organic, with industrial, including agricultural, chemistry, but the field has now been so enlarged that chemists have to specialise in particular branches, and the study of the nitrogen problem has in recent times been left chiefly to those interested in agricultural and industrial chemistry.

Nitrogen is the only important chemical element the great store of which in nature is found in the atmosphere. It is also the only element of primal importance to man and his industry

which occurs mainly in the free state in nature. All the other important chemical elements, like carbon, oxygen, iron, and potassium, are found mainly or entirely in chemical compounds. Nitrogen is a fundamental constituent of all living matter, and is therefore necessary to all animals and plants. It is required by them, not in the free state, but as compounds. Compounds of nitrogen are also of the greatest importance in some of our great industries, such as the textile, explosive, and dye-stuff industries. The natural supply of these very necessary compounds is not only limited, but there are constantly agencies at work liberating again free nitrogen from its compounds.

During the last few years much attention has been given to the manufacture of nitrogen compounds on the large scale from free nitrogen. The chief use for such compounds is as manure—that is, as raw material for the production of raw materials for the great food-stuff and textile industries, two of the primary industries on which society is founded. The demand for nitrogen compounds for manure is a very great one, and is increasing at a very rapid rate. The manure industry is of far greater importance than, say, the manufacture of dye-stuffs and fine chemicals from coal-tar, about which so much more noise is made, and is likely to increase in importance in the future at a far more rapid rate.

At present the chief concentrated nitrogenous manures are nitrate of soda and sulphate of ammonia. Nitrate of soda is all derived from the Chilian nitrate beds. In 1840 the total export from Chili was 10,100 tons. This had increased to 217,300 tons in 1880, and to 1,600,000 in 1905. The known supplies which still exist in Chili are very great. They have been variously estimated by different authorities, but even if we take the lowest estimates, and allow for a considerable increase in the consumption, they will last for a good many years. Nevertheless, we can foresee a time when they will be exhausted, especially as there is every probability that the demand will continue to increase for many years to come.

Until about thirty years ago we were the principal consumers of nitrate of soda; since then other countries have so rapidly advanced in intensive culture by the aid of artificial manures that the United Kingdom is now a comparatively small factor in the market. Germany comes first, and takes about five times as much nitrate as we do. The United States are the next largest consumers, and are increasing their consumpt with great rapidity, while several other countries are now larger consumers than the United Kingdom. If Russia, Canada, the Argentine, and China follow in the same way, the consumption of nitrate, which has increased from about 200,000 tons to some 1,700,000 tons in the last thirty years, may continue to increase

in the same way for the next thirty years. Already Japan is becoming an important market for artificial manures, and if China is developed in a similar manner, its huge, hard-working, intelligent population might easily become important consumers of nitrate.

Sulphate of ammonia is not so important to the world's markets as a source of nitrogenous manure as nitrate of soda, but so far as rapid increase in consumption goes there is a similar tale to tell about it. It is derived from the nitrogen of coal and shale. At present only a very small part of the ammonia available from the coal consumed is recovered. The recovery of ammonia might be enormously increased both in this and other countries, and as the demand for sulphate of ammonia is constantly increasing, it is probable that the production will continue to expand both in this and other countries at a rapid rate.

This constantly increasing demand for nitrogenous manures causes some anxiety as to the future, and many attempts have been made by commercial men and men of science to discover new sources of supply. Nitrogenous manures fetch a high price. They are much the dearest manures which the farmer has to buy. At present prices, nitrogen in the form of nitrate costs about 12s. 6d. per unit, while soluble phosphate, which is the most active form of phosphate, costs only about 1s. 11d. per unit, and potash, in muriate of potash, only about 3s. 6d. per unit.

At present some new sources of nitrogenous manure are being developed which may in a short time become serious rivals to the old ones. The new manures are nitrate of lime and calcium cyanamide, while sulphate of ammonia is now being manufactured from peat as well as from coal and shale.

### *Nitrate of Lime.*

In 1785 Cavendish described in the 'Philosophical Transactions,' in a paper on "Experiments in Air," some investigations in which, by the aid of electric sparks, he caused the constituents of the air to combine and form acid gases, which in turn combined with and saturated lime-water. Since that time the experiment of producing nitric acid from air by means of electric sparks has been a classical lecture-table experiment. But although a great many chemists and engineers have attempted to make use of this reaction on the large scale, the attempts were not commercially successful. Certain serious technical difficulties had to be overcome before this theoretically simple process could be developed into an economical method of preparing nitric acid and nitrates.

It was nearly 120 years after Cavendish described his experiments before a practical method of applying his reactions on the large scale was devised by two Norwegians—Professor Birkeland of the University of Christiania, and Mr Eyde, an engineer. In their process, air, or a mixture of nitrogen and oxygen, is passed through special electric furnaces, in which the electric arc is placed in a powerful magnetic field. In order that the process may be economically possible, electric energy has to be obtained cheaply. This is done by utilising water-power on the large scale. The first factory for the production of nitrate in this way is situated at Notodden, Norway, and commenced work in 1905.

Norway is a country in which an enormous amount of water-power is available. Strong groups of financiers have interested themselves in the process, and are said to have secured extensive water rights which will eventually render available three or four hundred thousand horse-power. If this is all used to manufacture nitrate, the present infant industry will grow in a few years to very large proportions, and will render the artificially produced nitrate quite a serious rival to the natural Chilian nitrate of soda. Inquiries are being made in other parts of the world for cheap water-power suitably situated for the carriage of products to the centres of nitrate consumption. There is a very large amount of water-power available in a mountainous and rainy country like Scotland, but unless it can be obtained and utilised cheaply it will not be able to compete with Norway, and the young industry will not find a home here.

Nitrate of lime was first produced on the large scale at Notodden, and the writer was able in 1906 to obtain, through the kindness of the producers, a quantity for experimental purposes. In 1907 and 1908 also quantities were obtained for experimental purposes, though it could not be purchased through the ordinary manure dealers. In future it will be obtainable in Scotland as manure through the ordinary channels. At first practically the whole supply was absorbed in Germany, but now agents have been appointed in this country, and it will be quoted in the markets here.

The artificially produced nitrate is nitrate of lime. In this nitric acid is combined with lime instead of with soda, as in Chilian nitrate. The production of nitrate of lime in 1908 is said to have been about 25,000 tons, and it is expected that in a few years the production will increase to 100,000 tons.

Nitrate of lime as at present turned out should contain about 13 per cent of nitrogen. Three samples analysed in the writer's laboratory contained 12·73 per cent, 12·14 per cent, and 13·07 per cent respectively. Commercial nitrate of soda contains

about 15·5 per cent of nitrogen. Nitrate of lime is a white or yellowish substance, which is very readily soluble in water. Unfortunately it also readily absorbs moisture from the atmosphere, and becomes liquid. This is its most objectionable property from the point of view of its use as a fertiliser, and will to some extent limit the uses to which it can be put. That it is very soluble and hygroscopic is not a disadvantage once it is applied to the soil, but an advantage, as it will ensure that it will soon become disseminated through the soil and reach the roots of plants. It will in this respect act even more readily and quickly than nitrate of soda. But if it has to be stored or mixed with other manures, its moisture-absorbing property will be a serious disadvantage.

That the nitrate is combined with lime instead of with soda will be an advantage rather than otherwise from an agricultural point of view. The natural nitrate which is formed in the soil by nitrification is mainly nitrate of lime, and it appears to be largely in this form that plants take up their nitrate under natural conditions. Lime also is an essential constituent of plants, while soda, though it is always present in greater or less proportion in the ash of plants, is not essential to them. When nitrate is used by plants a large part of the base with which it is combined is not retained by the plant, but remains in the soil. Nitrate of lime, therefore, will leave a certain residue of lime in the soil, and will so far make an addition of this very useful base to the soil.

As its power of absorbing moisture is likely to determine to some extent the uses to which nitrate of lime will be put, and the methods by which it will be handled in commerce and agriculture, I have made some experiments to determine how rapidly it gains moisture under different conditions, and to compare it in this respect with nitrate of soda. As is well known, commercial nitrate of soda is also somewhat hygroscopic, and is apt to become damp and run to waste when exposed to a damp atmosphere.

A bag containing about 10 lb. of nitrate of lime was left exposed to the atmosphere in an unheated store during the winter. In five weeks it had gained over 11 per cent in weight, and had become rather hard and lumpy. A couple of weeks later it was becoming distinctly wet, and after nine weeks, by which time it had increased in weight 17 per cent, liquid began to run away from it, and it began to lose in weight. A similar quantity of nitrate of soda, after five weeks, had not gained appreciably in weight, but had also become lumpy. After that it lost very slightly in weight, but did not become distinctly damp. When a similar bag of nitrate of lime was covered with a few sacks to protect it to some extent from the air, it gained

in weight much more slowly. Even after ten weeks it had gained only about 9 per cent, and, though beginning to get lumpy, was still sowable.

A portion was mixed with dry peat dust in the proportion of 5 of nitrate of lime with 1 of peat. It was hoped that the peat, which has great power of absorbing moisture, would help to keep the nitrate dry. But it was found that the gain of weight was more rapid where peat was used, probably because the peat, by keeping the mixture light and open in texture, let in the air more freely. After five weeks this mixture was quite damp, though still friable and sowable; after seven weeks it was quite wet, and liquid began to run out of the bag and escape.

When the nitrate of lime was made into a mixture with potash manure salt, steamed bone-flour, and superphosphate in the proportion of 1 part of nitrate of lime to 1 of potash manure salt,  $1\frac{1}{2}$  of steamed bone-flour, and  $1\frac{1}{2}$  of superphosphate, the mixture soon began to get damp. After four weeks it was distinctly damp though still friable, and in nine weeks it was quite wet and sticky, and was unfit for use.

These experiments show that if nitrate of lime is to be kept for any length of time, it will have to be in special packages which will protect it from free contact with the air. They also show that it will be difficult to make use of nitrate of lime in manure mixtures, except where such mixtures are to be used very soon after they are made.

### *Calcium Cyanamide.*

A short account of this substance was published in the 'Transactions' for 1906. Since then its production has increased very greatly, and two varieties of it were last season upon the market in this country. In nitrate of lime we have a manure newly introduced to agriculture on a commercial scale; but the value of nitrates as manure has long been thoroughly established, and it is well known that nitrate of lime is naturally formed in soils as a product of nitrification. In cyanamide, on the other hand, we have a quite new type of chemical substance, nothing resembling which has ever before been used as manure. Its properties and practical application as a manure have therefore had to be determined from the very beginning.

It was in 1895 that Professor A. Frank, working in conjunction with Dr Caro, discovered that carbides of calcium and barium could be caused to combine with nitrogen. At that time Frank and Caro were not seeking to prepare a manure, but were looking for a method of preparing ferro-cyanides and cyanides from atmospheric nitrogen ('Jour. Socy. Chem. Ind.,' xxvii. 1096). The products they obtained were the

cyanamides of calcium and barium. It was several years before the technical development of the processes was sufficiently advanced to permit of the preparation of these on a large scale. Meantime it was found that ammonia could be obtained from calcium cyanamide by heating it under pressure with water, and this was suggested at first as a means of preparing ammonium compounds from atmospheric nitrogen. Dr Albert Frank, the son of Professor Adolf Frank, however, suggested that the cyanamide could probably be used directly as a manure, and in 1901 manurial experiments were begun with it in Germany. The use of cyanamide as a manure began therefore with the twentieth century.

The early manuring experiments were so successful that the development of the manufacture has taken place, chiefly with the object of placing the cyanamide on the market as a fertiliser to compete with sulphate of ammonia and nitrate of soda.

The manufacture of calcium cyanamide, like that of nitrate of lime, depends on cheap electric power, for the calcium carbide from which the cyanamide is made is produced from lime and carbon in electric furnaces. Formerly the chief outlet for calcium carbide was for the production of the illuminating gas, acetylene; but since the advent of cyanamide, increasingly large quantities of carbide are being consumed in the manufacture of that product. Some of the cyanamide factories are being planted where carbide works already exist, and new joint carbide and cyanamide factories are being established where water-power in quantity can be obtained at prices which will enable electricity to be produced cheaply.

In order to form cyanamide, nitrogen is passed over calcium carbide, which is heated in furnaces to about  $1000^{\circ}$  C. The nitrogen which is used for this purpose is obtained from the air, where it exists in unlimited quantities. Upon each acre of land at sea-level there rests about 33,000 tons of nitrogen, equal to the nitrogen in about 200,000 tons of nitrate of soda. This is sufficient to form about 165,000 tons of calcium cyanamide of the purity which is at present being turned out. Atmospheric nitrogen, however, is mixed with rather more than one-fourth of its volume of oxygen, and before it can be used for the manufacture of cyanamide it must be freed from this gas. The process by which this is done is one of the most interesting parts of the manufacture.

Two methods of separating the oxygen are at present in use. One is to pass the air over heated copper, which combines with the oxygen to form copper oxide, but does not interfere with the nitrogen. The other method is to liquefy the air, and fractionally distil the liquid air so as to separate it into nitrogen

and oxygen, just as a distiller fractionally distills his wash so as to separate it into water and alcohol. This is a most interesting and important application of the recently discovered methods of producing liquid air in bulk. If it had been suggested a few years ago that the production of liquid air had any practical bearing on agriculture, the idea would have been treated by most people as whimsical; yet here, a few years after the classical research work which made the production of liquid air on a commercial scale possible, we have a practical application on a large scale to agriculture of this at first sight merely theoretical and quite disconnected discovery. This is an excellent example of the way in which the fruits of research are often gathered in quite unexpected places.

When the liquid air is fractionally distilled, the products obtained are nitrogen and a mixture of nitrogen with a large proportion of oxygen. This mixture, which is far richer in oxygen than ordinary air, is a by-product, for the manufacturer of cyanamide requires only the nitrogen. On the other hand, it would be an advantage to the manufacturer of nitrate of lime to be able to obtain in bulk air richer in oxygen than ordinary air. It has therefore been suggested that the two manufactures, nitrate of lime and cyanamide, might be economically carried on side by side.

Various modifications of the above described process of Frank and Caro have been devised; and one of these has been used on the large scale, and the cyanamide prepared by it placed on the market as a rival of that prepared by the Frank and Caro method. This process is known as the Polzeniusz process, after its inventor, Dr E. Polzeniusz. In it a small proportion of calcium chloride is added to the calcium carbide, and the resulting cyanamide therefore contains some calcium chloride. This is said to enable the combination of the carbide and nitrogen to take place more easily, and at a lower temperature.<sup>1</sup>

These two rival forms of calcium cyanamide have been placed upon the market under the names of "Lime nitrogen" (German *Kalkstickstoff*) and "Nitrogen lime" (German *Stickstoffkalk*). It is to be hoped that these names will not come into general use. They are literal translations of the names which have been given to these substances in Germany. In German there is no risk of their confusion with nitrate of lime.

In English it is quite otherwise. The terms nitrate of lime, nitrogen lime, and lime nitrogen will be with difficulty dis-

<sup>1</sup> Since the above was written I have learned that the rival producers of cyanamide have come to an agreement. There will therefore be no competition between the two different varieties of cyanamide in future. All the cyanamide on the British market this season is, I understand, to be sold as "nitrolime" or "lime nitrogen."—J. H.

tinguished except by experts, and will lead to endless confusion. The same objection applies to the term "nitrolime," under which "lime nitrogen" is this year being advertised. It will be better, therefore, if the new and distinctive term cyanamide, which is not liable to be confused with the name of any other manure, is applied to these manures in commerce and passes into ordinary use. It is, of course, a new and unfamiliar term, but it is the name of a new and unfamiliar manure, and will become familiar and common as quickly as the manure does.

The production of calcium cyanamide on a commercial scale began before that of nitrate of lime, and it still keeps the lead. It has already developed into an international industry of considerable proportions. The first factory to start production on a large scale is situated at Piano d'Orta, in the Abruzzi, Italy. This factory has now been increased to a productive capacity of 10,000 tons per annum. Large plants have also been erected at other places in Italy. Factories have also been erected, or are in course of erection, in Dalmatia, in France, in Switzerland, in Germany, in Norway, in Japan, and on the Canadian side of the Niagara Falls. When all these works are completed they will be able to turn out about 200,000 tons of cyanamide per annum. In addition to the above, all of which are to carry out the Frank and Caro process, there are the works at Westeregeln, Germany, which are producing cyanamide by the Polzeniusz process.

It is difficult to find out what is the actual production of calcium cyanamide at present, as it is continually increasing through the completion of new works or the extension of old ones, but it is said to be already very large. No works have been erected in Britain, which has so far taken very little part in developing this new industry. The west of Scotland, with its high land in close proximity to the sea, and with its heavy rainfall, would seem to be naturally marked out as a suitable locality for the development of this and other electro-chemical industries. To a certain extent the manufacture of aluminium is already finding a home there. If the cyanamide and nitrate of lime industries are also to do so, the water-power must be obtained cheaply and not at fancy prices. Otherwise the Scottish factories would not be able to compete with those of Norway, where the water-power can be obtained at very low rates, and where the factories are built with deep-sea carriage at their very doors.

At present the British market is being supplied with calcium cyanamide from a large factory situated near Odda, at the extreme southern end of the Hardanger Fjord, Norway. This factory, which belongs to the Frank and Caro group, is owned by a British company, "The North-Western Cyanamide Com-

pany, Limited." It is in the same neighbourhood that nitrate of lime also is being manufactured.

Commercial calcium cyanamide is a fine powder, nearly black in colour, with an alkaline reaction and a smell like calcium carbide. Pure calcium cyanamide,  $\text{CaCN}_2$ , contains 35 per cent of nitrogen, but the commercial article contains a good deal of carbon, lime, and other matters mixed with the cyanamide, and contains about 20 per cent of nitrogen.

The following table shows analyses of some samples analysed in the writer's laboratory:—

COMPOSITION OF COMMERCIAL CALCIUM CYANAMIDE.

	LIME NITROGEN		NITROGEN LIME	
	Per cent.	Per cent	Per cent	Per cent
*Calcium cyanamide ( $\text{CaCN}_2$ )	48.43	55.42	56.50	49.77
Carbon	13.16	16.15	14.27	12.72
Silica	5.72	4.67	4.00	7.04
Iron oxides	2.52	3.24	3.70	2.75
Calcium chloride	...	...	6.40	5.18
Lime	29.94	18.86	15.99	21.35
*Containing nitrogen	16.95	19.39	19.77	17.42

The endeavour of the producers is to turn out cyanamide with about the same percentage of nitrogen as sulphate of ammonia—namely, 20 per cent. As the above analyses show, the samples received have not been quite uniform in composition, and some of them have been considerably below 20 per cent in nitrogen. No doubt as the manufacturers gain more experience they will be able to produce an article of more uniform quality. Meantime, in view of the provisions of the Fertilisers and Feeding Stuffs Act, which require the seller to give a guarantee of the percentage of nitrogen correct within certain narrow limits of error, those who propose to handle this article would require to be careful that their consignments are up to the percentage of nitrogen stated.

When stored, cyanamide gains in weight from the absorption of moisture and carbon dioxide from the air. It does not, however, become damp like nitrate of lime. As shown in the analyses given above, it always contains a considerable percentage of free lime, and this causes the gradual absorption of atmospheric moisture and carbon dioxide. The nitrogen-lime variety gained in weight, in experiments carried out by the author, much more rapidly than the lime-nitrogen variety. But after three months' exposure, during which it gained nearly 19 per cent in weight, it still remained quite dry. Probably the rapid gain in weight of the nitrogen lime is due, in part at any rate, to the presence of calcium chloride, which

is a very hygroscopic substance. When kept exposed under the same conditions for the same length of time, lime nitrogen increased only about 7 per cent in weight. In both cases the quantity of material exposed was 11 lb., and it was enclosed in a bag made of ordinary sacking. This gain in weight is, of course, accompanied by a fall in the percentage of nitrogen. Manure dealers who handle cyanamide will require to be on their guard against this gain in weight and fall in percentage of nitrogen on exposure.

The two varieties of cyanamide exhibited another difference when kept. The lime nitrogen was still in fine sowable condition even after it had been exposed for about three months. But after an exposure of only five weeks the nitrogen lime was quite lumpy, and after ten weeks it was found to have set into one hard lump which required the exercise of considerable force to break it.

When cyanamide is mixed with superphosphate a considerable amount of heat is evolved, and the soluble phosphate of the superphosphate is reverted completely or partially to the insoluble condition by the lime of the cyanamide. Both varieties of cyanamide were made into mixtures with superphosphate, steamed bone-flour, and potash manure salt. These mixtures, when exposed in small sacks, remained in fine sowable condition even after three months' exposure. They gained gradually in weight, and the nitrogen-lime mixture gained more rapidly than the lime-nitrogen mixture.

#### *Field Experiments with New Nitrogenous Manures.*

In my article on calcium cyanamide in the 'Transactions' for 1906, the results of experiments on oats and barley carried out in north-east of Scotland were given. In these experiments, which were carried out in 1905, cyanamide was compared with sulphate of ammonia and nitrate of soda supplying an equal amount of nitrogen. The general result was to show that cyanamide was capable of giving an increase of crop practically equal to that given by sulphate of ammonia and nitrate of soda. Since 1905 further experiments have been carried out each season, in which nitrate of lime has been used as well as cyanamide. Experiments have been carried out not only on cereals but also on turnips. In each year the effect of the new manures has been measured in comparison with the effect produced by an equal weight of nitrogen, applied as the familiar manures nitrate of soda and sulphate of ammonia. In these experiments both varieties of calcium cyanamide have been used.

As in 1905, the general result has been to show that calcium

cyanamide is capable of giving as great an increase in cereal crops as the better-known manures. No real difference in this respect was found between the two varieties of cyanamide. As is usual in field experiments, the results varied somewhat from farm to farm. In some cases cyanamide did rather better than the old manures, and in other cases rather worse. Just as in different experiments it was found that sometimes nitrate of soda did better than sulphate of ammonia, and sometimes, with a slight alteration of conditions, the sulphate of ammonia came before the nitrate of soda. The general result of the experiments, however, is to show that, on the average, on land in the north of Scotland which requires nitrogenous manure, there is little difference, weight for weight of nitrogen, between these three different nitrogenous manures.

With turnips, the results obtained on the average from calcium cyanamide were not so good as those obtained from the application of an equal amount of nitrogen in the form of sulphate of ammonia.

It was stated by the earlier experimenters—most of whose experiments were made in pots—that to get the best results from calcium cyanamide it should be applied about a fortnight before the seed. Before its nitrogen becomes available to plants it must first be changed into ammonia and afterwards undergo nitrification, so that a little time has to elapse before these necessary changes can be completed. It was also stated that in its crude state, before it had undergone change in the soil, it was injurious to germinating seeds, and that therefore unless it was applied early it was liable to injure the braird. For two years in my grain experiments these points were tested by applying cyanamide to one plot ten to twenty days before the seed, and to another plot with the seed. On the average no difference was found between the plots. The germination of the seed did not appear to be injured, and the cyanamide appeared to undergo change rapidly enough in the soil, even when it was sown at the same time as the seed, to be ready for the crop as soon as the crop was ready to take it up.

In the case of the turnip experiments, also, the cyanamide was sown along with the seed, but in no case was any injury to germination noticed. As the young turnip plant is a very delicate one, this is an even more severe test of the effect of cyanamide on germination than in the case of grain crops. We may conclude, then, that under the conditions of practice in the north of Scotland it is not necessary to sow cyanamide before the seed, but that it may with safety be sown like sulphate of ammonia at the same time as the seed, provided excessive quantities are not used.

As stated above, nitrate of lime has been used in my experi-

ments during the past three years as well as cyanamide. It was expected that this nitrate would give results at least equal to those of nitrate of soda. This expectation has been fully justified. Indeed, the nitrate of lime has on the average given results rather better than those given by nitrate of soda supplying an equal weight of nitrogen. This is probably due to the presence of the lime, with which the nitrate is combined.

It was noticed again and again in the field experiments that when the plots which had received equal amounts of nitrogen in the different forms of nitrate of soda, sulphate of ammonia, cyanamide, and nitrate of lime were viewed side by side, the plot which had received nitrate of lime looked darkest in colour and most vigorous in growth. Practical men visiting the experiments were apt to remark that this plot must have received something extra. It was quite surprising in many cases to see how much stronger the nitrate of lime plot looked than the one which had been manured with so similar a manure as nitrate of soda. This appearance was confirmed when the crops were weighed, and it was found that the nitrate of lime plot gave on the average the heaviest crop both of grain and of straw.

The same thing was found in some pot experiments in which oats were grown in sand. As the sand contained practically no nitrogen, the plants had to depend for their nitrogen entirely on the manure supplied. The plots which received nitrate of lime grew bigger, darker green, and more vigorous plants than those manured with an equal weight of nitrogen in the forms of nitrate of soda, sulphate of ammonia, or calcium cyanamide.

These experiments were exhibited at the stand of the Aberdeen and North of Scotland Agricultural College at the Society's Show in 1908. There was no need to inspect the pots closely in order to see the difference. The nitrate of lime pots stood out most clearly and unmistakably in front of all the others.

Similar results were obtained in turnip experiments, which were carried out in collaboration with Mr R. B. Greig, Fordyce Lecturer in Agriculture, University of Aberdeen. In these experiments nitrate of soda was not used, but nitrate of lime gave results distinctly ahead of those given by sulphate of ammonia and calcium cyanamide, supplying an equal quantity of nitrogen.

One experiment was carried out by Mr Greig upon hay, and in this also nitrate of lime gave a remarkably great increase in the weight and vigour of the crop.

The general result of all these experiments seems to indicate that nitrate of lime is an even more active and valuable manure, weight for weight of nitrogen, than nitrate of soda.

## SHEEP MAGGOT AND RELATED FLIES :

## THEIR CLASSIFICATION, LIFE-HISTORY, AND HABITS.

By Dr R. STEWART MACDOUGALL, M.A., F.R.S.E., Entomologist  
to the Society.

ON account of complaints received from different parts of Scotland regarding losses due to maggot in sheep, the Directors of the Highland and Agricultural Society made arrangements for conducting investigations which might throw further light on such disputed questions as the fly or flies that "strike" the sheep, the distribution of the insect, and the spread of the pest to new and to higher grazing. Information was also invited as to preventive and remedial treatment. In the inquiry, which has extended over several years, the Society has had the cordial co-operation of a number of leading owners of flocks in various parts of the country, and to these and to all others who sent maggots taken from the live sheep the indebtedness of the Society and myself is here gratefully acknowledged. I would further express my indebtedness and thanks to Mr Percy H. Grimshaw, F.E.S., for the determination of the flies which were submitted to him.

I have included in this report notes on various flies that do not infest sheep, but are related to the sheep-maggot flies, partly because of their economic importance, and partly because in nearly all of them new facts, not yet quoted in the books, have been discovered with regard to their life-history.

*Prevalence of Maggot in Sheep.*

Returns received by me from flock-owners representing the whole of Scotland make mention of the presence of maggot among the sheep, although there is considerable variation in the percentage of attack stated. From Orkney, in response to a request for maggots, there came the reply, dated September 23, 1906: "We very seldom have any maggots here, none this summer, and there will be none this year now." Some in other parts of Scotland gave the percentage as low as 2 to 3 per cent, quite a number 5 to 10 per cent, and one at least very much higher.

An interesting point brought out in the inquiry relates not only to the widespreadness of maggot and its increasing frequency, but to its spread to high-lying hill pastures, where till recently in many places the attack seems to have been almost unknown. I give below representative statements, chosen as much as possible to avoid reduplication of answers from the same counties:—

"The maggots have been very prevalent in recent years, and the losses, especially among the lambs, have been very heavy; among ewes lighter, but on the increase. What strikes me most is the inroads maggots are making amongst purely hill sheep. Of course, among this class of stock detection is more difficult, and losses are becoming heavier. Till 1893 or 1894 we had no trouble with the maggots, unless in sheltered, woody, or low ground. About this time the fly began attacking ewes grazing on the hills; they have been getting worse every year, and now I am fully of opinion that sheep grazing at from 1900 to 2300 feet above the sea-level are just as likely to be attacked as sheep grazing in sheltered, woody, or low-ground pasture. Even on low ground the last few years there has been a steady increase year by year" (Mr David Reid, The Crofts, Ballater).

"On two grazings, one of 40 acres, at a height of 1200 feet above the sea-level, and the other of 250 acres, at 150 feet above the sea-level, I find the maggots worse on the higher. It is not above ten years since (1904) we first saw maggots at Braemar, except when we took home lambs from Lanark, and then the lambs might have been 'struck' further south on their way north" (the late Mr William Gordon, Auchallater, Braemar).

"Possibly 10 per cent are attacked among park-fed sheep, and in the fields the direct losses are slight, as the sheep are seen to twice every day, and those struck hand-dressed. On the hill ground 10 per cent may be the proportion attacked by maggots in recent years, and perhaps two-thirds of this number would be lambs; the losses amongst the lambs would average  $2\frac{1}{2}$  per cent. When a weaned lamb has been attacked by the fly, it is inclined to seek shelter amongst rush bushes or rank heather, or any sort of ravine. We are never troubled on the hill among ewe and wether hoggs" (Mr James Brown, Rhynie).

"Maggots had never been troublesome in this district till the season of 1899" (Mr P. J. Sinton, Glen Nevis, Fort William).

"Ten to fourteen years ago maggots were practically unknown in the hills in this district. For the last five or six years they have been a serious drawback, and are now quite common on the highest grazings in this quarter" (Mr Archibald Whyte, Glenmoy, Kirriemuir, 1904).

"In this district (Breadalbane) the fly is rapidly extending its area, and many high-lying farms, where up till quite recently maggots were unknown, are now badly infested" (Mr Alex. Campbell, Killin).

"Maggots were only known on the lower, more sheltered parts of this farm till 1900 or 1901, when all of a sudden, as it seemed to us, sheep were attacked on the highest-up hirsels, and considerable damage was done before the shepherds realised the situation. Since then the maggots have continued to attack sheep on all parts of the farm, but as their presence is looked

for our direct losses are small. But they entail a great amount of extra work" (Mr John Craig, Innergeldie, Comrie).

"During recent years the maggots have been found at a much higher altitude. On some parts of my farm maggots had not been seen until 1901" (Mr Peter M'Intyre, Tighnablair, Comrie).

"When I began sheep-farming in 1850 it was very rare to have sheep on the hills attacked by maggots. I cannot say I have suffered much loss from deaths, but I have been put to very great expense in extra shepherds and watching the lambs after weaning" (Mr Menzies, Finnart).

"Our experience is that maggots are becoming more prevalent higher up every year, and, indeed, in the summer of 1901 we had cases on the top of Ben Voirlich, 3224 feet" (the late Mr Thomas Walters, Glenample, Perthshire).

"Maggots have increased very much in recent years, and the last four years (1904) have been far worse than any previous time. Perhaps 2000 acres of the farm consist of broken land 1600 to 2000 feet above the sea-level. Until 1900 this was entirely free from attacks of maggots, but now we find it the worst of all to look after" (Mr William Cairns, Glen Artney, Perthshire).

"Maggots do not cause much loss on this farm; in fact, till within the last three years (1900-1904) we had scarcely any sheep troubled with them. There is no doubt the fly is on the increase in this district. I know farms in the neighbourhood where maggots were comparatively unknown till 1898 which are now pretty bad with them" (Mr R. Macdiarmid, Lochawe).

"Very little attack until the last few years" (Ardtornish, Oban).

"Maggots seem to me to be very much on the increase in recent years" (Mr James Allan, Annan).

"Within the last few years there has undoubtedly been a great increase in the number of sheep affected with maggots in hill land. Up till recently it was rare to see a maggotted sheep on the higher-lying farms from 800 to 2000 feet; now it is quite common" (Mr Wm. A. M'Turk, Barlae, Dalry).

"We have maggots in the low ground, but also in high exposed mountain-land, where, till the last few years, maggots were never known" (Mr James Moffat, Gateside, Dumfries).

"Of late years maggot has been found on high, bare hill-land" (Mr T. Welsh, Ericstane, Moffat).

"There is no doubt that the maggot-fly has increased in recent years, and the maggots are now found in higher altitudes than formerly (1904)" (the late Mr Walter Elliot, Hollybush, Selkirkshire).

A return from Caithness and one from Ross gave hill pasture attack as almost unknown.

*The Harmful Species.*

From the experimental record which follows it will be abundantly evident that the sheep maggot-fly by "bad eminence," and the one that is the chief cause of loss and injury to the sheep, is *Lucilia sericata*, although *Calliphora erythrocephala* is also a culprit.

There has been knowledge for a long time that two flies may strike the sheep. In nearly fifty communications this was stated, and I have been told it by word of mouth again and again. I shall refer later to the matter, but may here quote from some of the letters:—

"There are two flies—a large one and a small one; and two maggots—a larger and a smaller. The large maggot moves over the body of the sheep before piercing, the small one cuts directly into the spot where the fly strikes. The small one is the worst" (Ayrshire).

"Of the two maggots, the smaller is much more fatal, and digs deeper into the animal" (Bute).

"There are two kinds of maggot. The smaller ones burrow into the flesh of the sheep, the larger ones are more surface feeders" (Dumbarton).

"There are certainly two kinds of maggot—the larger much more easily got out, and it does not cut the sheep unless in great numbers; the small ones dig in at once, and are very hard to remove" (Dumfries).

"The big maggots don't cut in much, but work more along the back; the small ones are much more lively, and cut inwards far oftener" (Forfar).

"There are two maggots—the smaller far more active, inclining to burrow into the skin at once" (Kirkcudbright).

"The blue-bottle will strike where the sheep is dirty and has a smell; but the green-bottle will strike on the back and everywhere, even though the sheep is quite dry. Of the two maggots, the large one—not nearly so troublesome or dangerous—spreads quickly over the sheep in any direction, and seldom does worse than graze the skin, whereas the smaller ones eat their way right into the body and kill the sheep" (Lanark).

"There are two varieties of maggot, as distinct as the flies. The larger one, which we ascribe to the larger fly, is almost invariably found on sheep that are dirty, and appears to come to maturity in many cases without cutting through the skin to any extent. The smaller, and infinitely the worse, is got on every part of the sheep, often without appearance of anything to attract them to that particular spot. They cut deep through the skin in a very short time" (Perth).

"The larger maggot feeds on the surface, and at most breaks the skin; the smaller maggots of the green-bottle are quicker

in their movements and always burrow into the skin in colonies" (Dumfries).

#### CHARACTERS OF THE ORDER DIPTERA OR TWO-WINGED FLIES.

The sheep-maggot and related flies belong to the Order Diptera or Two-winged Insects. The wings of the insects of this Order are membranous, and as a rule transparent. These flying wings are borne by the large middle segment of the thorax. On the metathorax, and taking the place of the second pair of wings of other insects, are the halteres or balancers; these balancers are highly complex, sensory structures. The mouth parts are fitted for a liquid diet; they vary much in complexity, from those of the bot-flies where they are rudimentary and useless, to the lancets and piercing mouth-parts of the mosquitoes and the gad-flies (*Tabanidae*).

The metamorphosis is complete—the four stages being imago, egg, larva, pupa—and the life-cycle is often passed through very rapidly, this being especially so with such as have a scavenger habit. The larva may be a legless maggot with a pointed head and furnished with two mouth-hooks, but without eyes and antennæ; on the other hand, there are some species whose larvæ have a somewhat more marked head region, mandibles and maxillæ being demonstrable; the larvæ with this better developed head region may show simple eyes and rudimentary antennæ and organs of locomotion. In the majority of cases the larva is terrestrial, but in some families aquatic larvæ are found.

The pupa is of two forms. In the one case it is mummy-like; in the other the last moulted skin—chitinised—of the full-fed larva remains as a protecting case or puparium, under cover of which the changes which result in the formation of the imago take place.

#### *Habits.*

The Order is one of very great importance; the habit is very varied. Most of the adults are creatures of the sunshine; some fly by night. Some are of service in the pollination of flowers; some feed on the honey and sweet juices of plants; others feed on blood, and may act as the carriers of parasites, which, introduced to the blood of the host on which the fly feeds, may result in fatal diseases. The larvæ of many species are injurious to crop plants; some prey on live animals, and some are parasitic on other insects.

The Order may be classified as follows:—

#### I. SUB-ORDER ORTHORRAPHA.

The flies issue after pupation through a T-shaped opening in the back of the larval skin; in the pupa the outlines of the imago are observable—*i.e.*, the pupæ are mummy-like.

(a) *Section Nematocera or Nemocera.*

The antennæ have more than six joints (typically they are many-jointed and long), and they are not terminated by an arista;<sup>1</sup> the palpi are slender, and four- or five-jointed—*e.g.* gall-midges, midges, gnats or mosquitoes, crane-flies.

(b) *Section Brachycera.*

The antennæ are short and three-jointed; an arista may be present, and then it is terminal; the palpi have only one or two joints—*e.g.*, gad-flies (*Tabanidæ*) and the predaceous robber-flies (*Asilidæ*) which chase other insects and transfix them with their beak.

## II. SUB-ORDER CYCLORRAPHA.

The flies escape, after pupation, through a circular opening made by pushing off the head-end of the puparium; the pupæ are barrel-shaped—*e.g.*, bot-flies (*Estridæ*), Tachinia-flies (whose larvæ are parasitic on caterpillars), flesh-flies, house-fly, stable-fly, blue- and green-bottles, carrot-fly, cabbage-fly, and numerous leaf-miners.

## III. SUB-ORDER PUPIPARA.

These are parasites living externally on mammals and birds (one species is found in bee-hives, parasitic on the bee) and sucking blood; the larvæ are nourished, right up to the full-fed condition, inside the body of the mother—*e.g.*, sheep-ked.

In this Report we are concerned with the flies of practically a single Dipterous Family, the Muscidæ Family, and for the most part with such species of this Family whose maggots live on live sheep, or in carrion, or are dung-infesting, or which as adults come into relation with man as blood-suckers.

*The Family Muscidæ.*

Restricting this family name to those flies that have the balancers covered by hood-like lobes or squamæ,<sup>2</sup> we have here flies with three-jointed antennæ, the third joint being the largest and having a bristle (arista) springing from it. The larvæ are legless maggots, and come from eggs laid to the outside. Of the numerous Genera in this Family we are chiefly concerned with five, which may be contrasted and distinguished thus:<sup>3</sup>—

<sup>1</sup> The arista is a bristle borne by the third joint of each antenna.

<sup>2</sup> *Insects*, Part II., 'The Cambridge Natural History,' by Dr David Sharp, p. 447.

<sup>3</sup> For a detailed and extremely useful set of Analytical Tables, see 'A Preliminary List of Durham Diptera,' by the Rev. W. J. Wingate.

LUCILIA.	CALLIPHORA.	MYTOSPILA.	MUSCA.	STOMOXYS.
<i>Green-bottles.</i>	<i>Blue-bottles.</i>		<i>House-fly.</i>	<i>Stable-fly.</i>
Arista thickly plumed on both sides.	Arista thickly plumed on both sides.	Arista thickly plumed on both sides.	Arista thickly plumed on both sides.	Arista plumed on the upper side only; proboscis protruding far in front of the head, and hard for piercing; palpi short.
Apical section of the fourth longitudinal vein of the wing sharply bent upwards, almost at a right angle.	Apical section of the fourth longitudinal vein of the wing sharply bent upwards, almost at a right angle.	The apical section of the fourth longitudinal vein is only slightly bent upwards close to its end.	The apical section of the fourth longitudinal vein of the wing sharply bent upwards towards the third longitudinal vein, very nearly touching it at the wing-margin.	A closely allied Genus, also blood-sucking, is Hæmatobia, but the palpi here are nearly as long as the projecting proboscis.
Thorax and abdomen brilliantly metallic, and the ground colour not concealed by light dusting.	Thorax and abdomen not brilliantly metallic; the thorax shows a light dusting.	Abdomen with four dull brown spots on a grey ground.		
The forehead between the eyes and the parts below the cheeks and the eyes not metallic.	The space in front of the eyes has a number of hairs in fresh specimens.			
The hairs characteristic of a fresh Calliphora are absent here.	The wings when at rest are held at an angle to the body.			
	More sombre flies than the first-mentioned Genus.			

THE GENUS *LUCILIA*.

Two *Lucilia* species may be contrasted in detail—viz, *Lucilia sericata*<sup>1</sup> and *Lucilia caesar* (fig. 17).

*L. sericata*.

The forehead between the eyes in the male not very narrow. The eyes are separate.

In the female the space between the eyes occupies one-third of the breadth of the head.

Face whitish.

There are three pairs of central bristles on the median forebody segment.

First two segments of abdomen blackish.

The third abdominal segment is comparatively small, and is hidden by long silky hairs.

There is a blue sheen or shimmer associated with the bright golden-green.

Smaller if anything, the body length being 6 mm. to 8 mm.

The proboscis in both cases is soft and is not a piercing organ.

A possible British species is *L. nobilis*, Meigen, to whose maggots have been ascribed an attack on man:<sup>2</sup> "The larvae were observed by Meinert in Copenhagen in the auditory meatus of a person who, after taking a bath, fell asleep in the open air, and on waking felt singing in the ears, and had a sensation as if there were water in the auditory canal. During the next days severe pains set in, and there was a discharge of blood and pus from both ears as well as from the nose. On washing out the meatus the maggots made their appearance."

An American species, *Lucilia (Comptosia) macelluria*, Fab., has a very bad reputation, its eggs being laid, and the maggots found destroying the tissues, in wounds and exposed openings of the body; the maggots have been the cause of great suffering in man and domesticated animals.

*L. caesar*.

The forehead between the eyes in the male is very narrow, and the eyes touch behind.

In the female the space between the eyes distinctly broad.

Face whitish, red in the middle and about the mouth.

The front pair of these three pairs of bristles absent.

First segment of abdomen blackish.

This sheen is absent.

Body length, 7.5 mm. to 11 mm.

<sup>1</sup> See Schiner's 'Fauna Austriaca'; and Professor G. H. Carpenter in the 'Economic Proceedings of the Royal Dublin Society,' vol. i., July 1902, part 3, p. 136; and Wingate's 'Durham Diptera.'

<sup>2</sup> 'Animal Parasites of Man,' by Dr Max Braun, p. 437.

THE SHEEP MAGGOT-FLY (*Lucilia sericata*), Meigen.

This glossy, golden-green fly (fig. 18) lays its eggs on the wool of the sheep.

The egg is less than  $\frac{1}{8}$  of an inch long, and yellow-white in colour; it is elongated oval in shape; to the naked eye or under a low magnification the egg-shell is smooth, but under a high magnification there is a net-like pattern, the shell being divided up into areas by ridges.

The maggot is legless, with pointed head-end provided with

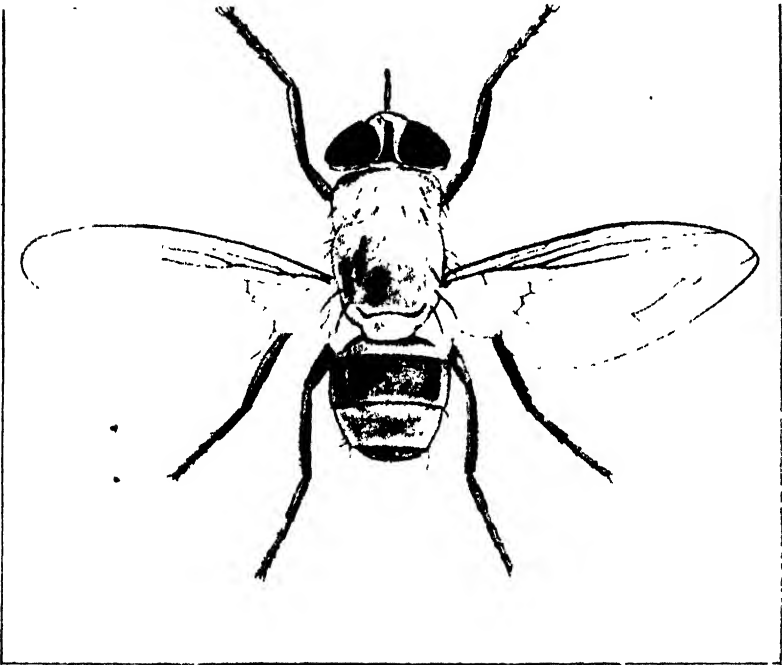


Fig. 17. - *Lucilia caesar*. (After Brauer)

mouth-hooks and a truncate hind-end. On each side of the first segment behind the head there is a fan-shaped spiracle with ten openings (there seem to be slight variations). On the anterior edge of each segment are small spines, which are of service in locomotion, and probably, in the burrowing of the larva, prevent a backward movement.

The posterior face of the last segment has an upper portion with eight large and four small projections; this is the spiracular portion, there being two horny plates on each of which is a spiracle; these spiracles, in the case of a maggot in its last

stage, have each three slits. The part below the spiracular field is the anal region, and this lower anal part can be protruded and be of service in locomotion.

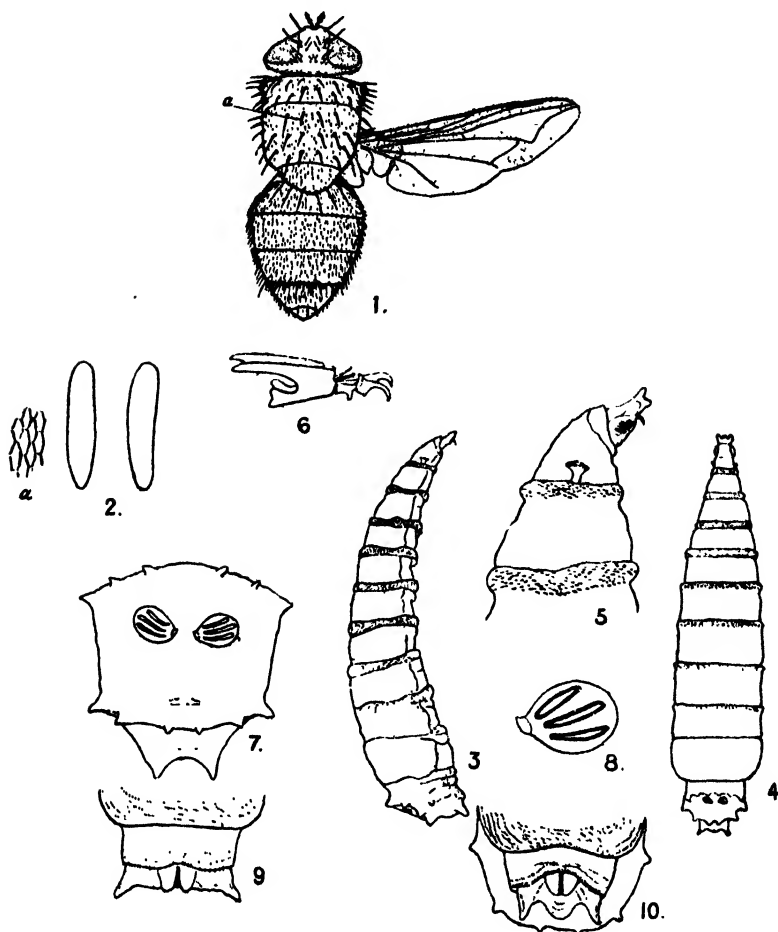


Fig. 18.—*Lucilia sericata*. (From Professor Carpenter.)

1. *Lucilia sericata*, female,  $\times 4$ . 2. Eggs of *L. sericata*  $\times 10$  (*n*—sculptured surface of egg). 3. Larva from side  $\times 4$ . 4. Larva from above  $\times 4$ . 5. Head-end of larva, showing the fan-like spiracle,  $\times 12$ . 6. Mouth-hooks and skeletal supports of larva  $\times 12$ . 7. Tail-end of larva from above  $\times 12$ . 8. Right spiracular plate  $\times 25$ . 9. Tail-end of larva from beneath, with anal region protruded,  $\times 16$ . 10. The same, with anal region retracted,  $\times 16$ .

The full-fed maggot measures up to half an inch and over; there is variation according as it is quiescent or expanded. In colour the maggot is white or yellow-white.

The puparium is brown, and rounded or barrel-shaped; it

consists of the last-moulted skin of the maggot, and at first is quite light in colour, then becomes red, and at last is dark-red or brown.

*Life-history.*

The female settles on the sheep and lays her eggs on the wool of the sheep, fixed in little heaps or clusters of twenty or more. By twenty-four hours the eggs can have hatched. The maggots feed at first externally, but are determined borers and enter the flesh by means of their mouth-hooks, to tunnel in the muscle. A neglected sheep invaded by these parasites is soon reduced to a sad condition, the torment ending in death. When full-grown the maggots leave the flesh and drop to the ground for pupation. In my experiments the full-fed maggots very readily buried themselves in the earth or sand provided.

In the most favourable conditions the life-cycle can be passed through in from twenty-five days to a month; but cold or other unfavourable condition may result in a considerable lengthening out of the cycle. Probably a fortnight may be taken to represent the larval life in favourable environment. As regards the length of the puparium stage, I have—with the puparia kept in summer in a room without a fire—bred out the fly in 9 days, and in another two cases in 10 days, and still another in 11 days, but as a rule the time was longer—13, 14, 15, 16, 17, 19, 20, 21 days, all being times recorded in the experiments.

In one experiment, larvæ of *Lucilia sericata* were taken from a live sheep, and after having been fed on fresh mutton were placed in a cardboard box containing some soil, on August 14. This box was kept in the laboratory. A number of the larvæ pupated at once, and in due course the adult flies issued. A further examination of this material on October 2 revealed a number of larvæ, still larvæ and able to move about. Thirty of these were taken and placed in another receptacle, a little water being sprinkled over the soil. By October 4 a fresh, light-yellow puparium was seen.

On October 7 another puparium was got, and six others by October 14.

On October 17 the fly issued from the puparium of October 4, thirteen or fourteen days from the time of the appearance of the puparium, but over two months from the time the larva had ceased to feed.

Between November 4 and November 10 two more larvæ pupated, and two flies appeared by November 25. Between December 2 and December 5 other two *Lucilia sericata* came away, and still others later in the month.

*The Months for Maggot.*

January, February, March, and December are the only months in the year in which I have no record of the presence of maggot. From Perthshire I have a record of maggots being found on sheep by April 15, from Lanarkshire on April 24, and an April attack from Bute. The maggots themselves were not sent to me, and I cannot say, therefore, that *Lucilia sericata* was the species. From Perthshire and Forfarshire I have records of maggots in October, and an exceptional case was reported to me from Kirkcudbright with the maggot as late as November 6. By June in ordinary season the maggots of *Lucilia sericata* may be found at work, and attack is at its height in August, the bad period extending from the middle or end of July to the beginning of September.

The periods of onset of the fly and of the disease being at its height should be carefully observed, as they suggest not only the times when special vigilance is necessary, but also have a very important relation to dipping periods.

*Breed and Class of Sheep Attacked.*

The evidence indicates that no one breed or class of sheep succeeds in escaping the attention of the fly. Lambs, however, suffer most. In some cases attack on Blackface sheep was said to be worse than on Cheviots. Carpenter<sup>1</sup> quotes thus from a work published in Dublin in 1749: "The Sheep and the Lambs most liable to the Breed of Maggots are those that carry the most and closest wool on their Backs, and the more they are frequently heated by driving them out of their natural walk, the sooner they come under the misfortune." Lambs too, specially, are often struck on the top of the shoulder and even the head.

*Conditions Favourable for the Flies; likely Habitats and Probable Causes of Increase and Spread.*

WEATHER.—The character of the weather has an important influence on the presence and activity of the flies. The following are typical statements from many that have reached me:—

"In showery weather, with sunshine, the maggot is more plentiful than in dry weather."

"Double the cases in close moist weather than occur in dry weather."

<sup>1</sup> *The Sheep-Fly*, by Professor G. H. Carpenter, in 'Economic Proceedings of the Royal Dublin Society,' vol. i., part 3, p. 133.

"The fly strikes mostly in showery and thundery weather. After a hot May or June there is always a bad plague of maggots."

"The chief factor in regulating the extent of the attack is the weather. Damp, warm, close weather favours."

"Under a hot burning sun after a thunder-shower."

"After a spell of hot weather, when a shower of rain comes and wets the wool, the yolk being strong attracts the fly."

**SHELTERED AND WOODY PLACES.**—There is much agreement that sheltered woody places are much affected by the fly. In some thirty communications the phrase "sheltered woody places" occurs; in other replies there are such modifications as—

"A field near any sort of hedge generally worse than in the open."

"Most prevalent on farms with hedges."

"Woods and shelter places during May and June; all over the farm, hill and dale, in July and August" (Inverness).

"In sheltered places, except in very warm weather, when the fly is quite as bad on exposed hillsides" (Kirkcudbright).

"Sheltered places such as banks alongside streams" (Mid-Lothian).

"Shelter places, whether the shelter be woods or hillocks" (Ayrshire).

"Near plantations and on grassy land, especially in the neighbourhood of rocks" (Ayrshire).

"In sandy hollows" (Fife).

"Most on sandy land where there are sheep-scrapes," and "sheltered and sandy places near water" (Forfar).

"More flies are seen in dykes with turf coping than anywhere else" (Argyllshire).

"During the maggot season the sheep do not come lower than 800 feet above sea-level. There are no woods, but a considerable portion of the lower ground is badly overgrown with ferns. The hill, which ascends to over 3000 feet, is almost entirely green, and the higher ground is as badly affected as the low and sheltered parts" (Mr Campbell, Boreland Farm, Killin).

**BRACKENS.**—A number of communications mention brackens as favouring the fly, and where rank, as making "struck" sheep difficult to find. Thus:—

"Wherever there is cover such as bracken, rocks, or plantations, the flies seem to congregate most, as they shelter in such places at night" (the late Mr R. Sinclair Scott, Largs).

"The very large increase of brackens on many hills is the cause of a larger death-rate from maggots than formerly. Sheep 'struck' get in among the brackens, and are not seen by the shepherd. On some of the Loch Lomond hills brackens are six feet high" (Mr James Lumsden of Arden).

"I think since brackens and thistle got so bad on hill ground, maggots have been sadly on the increase" (Mr John Elliot, Hindhope).

"My farm is entirely free from plantation, and the lowest elevation of my hill pasture is fully 300 feet above the sea-level, reaching to about 1500 feet. The fly is most prevalent in the lowest parts, especially amongst brackens. It is very rare in the highest parts" (Mr John Craig).

Long heather is sometimes mentioned as favouring the fly, but others who mention it do not complain of it.

Rank grass is noted in one letter from Forfarshire as affording cover for the flies.

**DIRTY SHEEP.**—There is unanimous testimony to the flies being attracted to dirty sheep. Dirty sheep are said practically to invite attack. While this is true, I have proof that *Lucilia sericata* may and does "strike" sheep that are perfectly clean; the shoulder, for example, in a lamb was "struck" where there was no dirt, and where the hindquarters were clean and absolutely without maggots.

**STARLINGS.**—The starling has increased greatly in numbers in many parts of the country, and four separate correspondents associate an increase in maggot with the increase in numbers of the birds. I quote from two of the statements:—

"I consider the cause of the maggot being very much commoner to be the great increase in starlings in this district. The starling leaves filth on the sheep, and the fly 'strikes.'"

"Even when sheep have been kept clean, the cause of their being struck has been found to arise through filth dropped on the sheep by the starlings, which often appear in great numbers on the pastures."

As opposed to this view, a Dumfriesshire correspondent writes to me thus: "Starlings have nothing to do with the increase of maggot, though the opposite may be true to some extent. Maggots have increased most in districts where starlings are rare and maggots hitherto almost unknown."

The starling, moreover, is a bird of very great service in agriculture, insects forming the great bulk of its food. The nestlings are diligently fed almost entirely on insects, whilst the adult birds destroy great quantities of insects, although, as the records show,<sup>1</sup> their diet is not exclusively an insect one. In some parts of the country the fruit-grower looks upon the starling as levying too severe a toll upon his fruit.

<sup>1</sup> Sir John Gilmour's Report, in 'Transactions of Highland and Agricultural Society' for 1896; and "The Food of some British Birds," by Robert Newstead, M.Sc., A.L.S., Supplement to 'The Journal of the Board of Agriculture,' December 1908.

*Symptoms and Accompaniments of Attack.*

Sheep infested with maggot show the following symptoms :—

A matting together of the wool fibres.

Discoloration of the wool where the maggots are at work.

A continual wagging of the tail.

Rubbing and biting by the sheep in their efforts to allay the irritation caused by the maggots ; much inflammation.

The oozing from the sores of an evil-smelling sticky fluid.

A falling out of the wool, which in bad cases does not grow on again.

Rapid loss of condition, and death if the sheep be neglected.

One of my correspondents, Mr John A. Carlyle, writes :  
 “ Affected sheep, even when not very bad, have a peculiar way of looking back ‘over their shoulder,’ which, once noticed, is easily recognised again.”

*Losses, Direct and Indirect.*

Very severe direct loss in the shape of death of the maggot-infested sheep is not often reported, and such loss, as is natural, is chiefly on hill farms. The tortured sheep has a tendency to wander away from its fellows, and to get into places where it is not found, no matter how vigilant the shepherds. On low ground the oversight of the sheep is much easier, and deaths are not numerous. The watchfulness of the shepherd is of great importance, and he has much in his power in the way of prevention and alleviation. As one letter puts it : “ The loss from maggots would be very heavy did the shepherds not keep continually on the outlook for any infected sheep, which are at once treated.”

In a communication from Inverness-shire we have a statement of a loss of ewes—twenty per season ; and in another from Perthshire the flockmaster reported—from hill ground 800 feet to 1760 feet high—that in the month of August 1900, when the shepherds were attending markets, he lost twenty sheep in a few days.

But if the percentage of direct loss from death is low, indirect loss is heavy ; such indirect loss as—

- (a) The extra work entailed on the shepherds. Where the sheep may be all seen at least once a-day the greatest loss is due to the increase of labour. Little damage is done unless two days elapse before the sheep are attended.
- (b) The necessary employment of extra hands, with the consequent expense.

- (c) The disturbance to the stock by the continual hunting and collecting of them.
- (d) Sheep after being struck thrive badly, and fetch less in the market. Attacked sheep are depreciated in value and take some time to recover, and even then, if attack has been bad, they never seem to thrive as well as before.
- (e) Constitutional disturbance.
- (f) The sheep are disfigured, the wool not coming again readily.
- (g) Disfiguration, too, lessens the value. Lambs, for example, may not be able to be sold with the others on account of their skin being broken.

### *Preventive Treatment.*

1. **CLEANLINESS.**—Sheep should be kept as clean as possible about their hindquarters. A good preventive is to clip the wool of the tail and between the hind legs, docking the tails of sheep when too long. The purpose is to clear away any filth, and to leave as little chance as possible for lodgment.

One correspondent wrote: "The most useful preventive is the free use of the sheep-shears in removing any dung from the fleece or any dried blood or discharges which may remain attached to the wool after lambing. Clipping the tails of the hogs and ewes in spring or the beginning of summer, and cutting all wool which may get wet with the urine or soiled with the fæces, help very much in preventing the attacks of the fly."

At the same time, while clean sheep are more likely to escape the attention of the fly, yet if the fly be prevalent clean sheep are struck. The eggs are certainly sometimes laid quite away from the anal region, and on perfectly clean parts of the sheep.

2. "A very good plan is to have—if the ground be suitable—a number of little banks or 'rubbing scaurs,' where the sheep can rub and get a certain amount of sand or earth into the wool. This is not a happy state of things for the maggot, and often prevents the fly striking" (Mr John A. Carlyle).

3. **DIPS AND DIPPING.**—Apart from the ordinary farm practice of dipping, a number of flockmasters are forced to dip for maggot alone. Thus one wrote: "I have been forced to dip the hill sheep twice in the season for several years back. Park sheep scoured with soap and water at the end of June were generally dipped again in July and the beginning of August." Dipping is certainly of service as a preventive measure, but the immunity that dipping brings does not persist for a long time.

The following are from some of the reports sent in from various parts of Scotland:—

"The July dip of all sheep is of the utmost value in keeping fly off. In closely sheltered situations another dip a month later amply repays the small cost and labour."

"I have tried many sheep-dips on lambs, and my experience is that after dipping they are as liable to be struck again."

"No dip I have used has prevented striking for a longer time than a fortnight to three weeks."

"No dips we have tried will keep the sheep clean for longer than a fortnight, especially lambs on foggage."

"I have seen the same sheep attacked three times in the same season, after being each time thoroughly cleaned and dipped."

"All dips seem effective for a week or so, or so long as the strong smell remains; but after heavy rains the fly attacks very soon after dipping."

In the schedules returned to the Highland and Agricultural Society, practically every one of the well-known dips, and numerous more or less local dips, were written of favourably as effective for a short time at least. Sulphur, and dips containing sulphur as one of the ingredients, seemed most in favour by way of preventive:—

"A dip with sulphur as its chief ingredient, but dry sulphur as good as any."

"A dip composed of sulphur, arsenic, soda, and soft soap is most useful for keeping off the flies."

"The best dip is a sulphur one, mixed with a greasy one to make it stick longer."

"Do not wash the sheep with plain water to clean them, as the fly strikes before they get dry, unless sulphur is sprinkled on."

"The most useful preventive is a dip made of arsenic and sulphur. It suits well in dry weather, but no dip is a preventive in warm, moist weather. The more showery the weather the less effective the dips."

"It is almost impossible to keep rams free in damp weather, unless you constantly open their wool and dust them full of sulphur."

"To prevent maggots breeding behind the horns of rams, olive-oil and pitch-oil should be poured there, and the oil dusted with sulphur."

Carbolic dips are not serviceable as regards prevention.

#### *Remedial Measures.*

1. Infested sheep should be isolated.
2. The maggots should be picked or rubbed off, or where they have got to work, the wool may be shorn a little, and the

affected parts dressed with a mixture of turpentine and rape-oil in equal parts, or with dilute paraffin-oil, finishing off with a dusting of sulphur. Cuff's fly-oil is useful. The drawback is the expense. In addition to killing the maggots, this fly-oil serves to keep the fly for a day or two from settling on the place to which it has been applied; and if, after dressing, the part be dusted with sulphur the protection is greater. The oil must not be used too strong, as if the maggots be killed at once they are difficult to remove from the wool, and sheep so treated will be struck again.

One farmer writes in favour of equal quantities of paraffin-oil and butter-milk mixed well, and applied to the affected parts.

*Proof that Lucilia Sericata is THE Maggot-fly of Sheep.*

During the last two or three summers I have had sent to me maggots from sheep. In every case which I quote below the reader will understand that I have written testimony that *the maggots were taken actually from live sheep, and in no case from the dead carcass*. Such live maggots were sent to me or recorded from every county in Scotland, except Sutherland, Nairn, and Renfrew, many hundreds having been received. I also received material from four English counties,—Northumberland, Cumberland, Yorkshire, Lincolnshire,—and from County Down and County Londonderry in Ireland.

The maggots of related Dipterous insects are often so like one another as to be practically indistinguishable. The number of openings in the prothoracic spiracles is made use of as a microscopic test. This does not seem to be an infallible test, however; and while one might reach certainty in separating the maggots of *Lucilia sericata* (Green-bottle) from those of *Calliphora erythrocephala* (Blue-bottle), yet to determine *Lucilia sericata* from *Lucilia caesar* in the maggot stage was so open to question that the method I adopted was to breed out the fly. Wherever, then, it is stated the fly was *Lucilia sericata*, this means that the determination has been made from the adult insect, bred out from maggots received.

The method adopted was as follows: As each sending of maggots arrived some were taken for microscopic examination, but the majority were placed in a glass receptacle secured at the top by a cotton cover several folds thick. Previous to the introduction of the maggots a piece of fresh mutton newly bought was placed in the receptacle. Each batch of maggots was kept by itself as it arrived. The receptacles were placed out in the open, exposed in every way, save that in heavy rain a board was placed over all to keep out the rain. In some cases fresh

mutton was added as the previous piece underwent putrefaction, but in many cases the mutton remained unchanged, so that the maggots were really completing their growth in carrion. As the maggots ceased to feed they were noticed to climb to the cotton cover, where they collected. Sometimes pupation would take place in creases and folds in the cover; but the experiments were regularly revised, and as the maggots were seen to cease feeding and collect, they were allowed on removal of the cover to drop into another receptacle containing sand or garden soil. This receptacle was duly secured, so that when the flies issued from the puparia, escape into the room or into the open air was impossible. The adult flies were then removed and examined for determination of the species.

I give on pp. 154, 155 the record of the flies bred out by me from maggots.

It is interesting to find in the list one case where the maggots were taken from a horse. Mr William Brown, M.R.C.V.S., who sent them to me, wrote that he had taken them from the back of a horse's leg, which he had recently fired and blistered.

Mr Brown also sent to me, in the autumn of 1906, maggots which he had taken from a two-year-old stirk. The stirk was very bad with angleberries on the neck and withers, and the flies had struck him there. The flies from these maggots also proved to be *Lucilia sericata*.

There can be no doubt, I think, from the foregoing, that *Lucilia sericata* is the common Sheep Maggot-fly. It will be seen to have been found at work on the sheep from June onwards to the autumn. I have actual records of maggots on sheep in May and even April, but the maggots themselves were not sent, and therefore I cannot say absolutely that *Lucilia sericata* was the culprit in these cases.

Mr E. E. Austen of the Natural History Museum, South Kensington, wrote me that on an occasion on which he personally bred out maggots from live sheep the species was *Lucilia sericata*, and he believes *Lucilia sericata* to be the characteristic sheep maggot-fly.

Flies bred out by Professor Carpenter from maggots taken from live sheep in County Wicklow also proved to be *Lucilia sericata*.

Mr Fred V. Theobald, in a letter to me, says that amongst a flock of Southdowns near Wye, Kent, *Lucilia sericata* was the enemy.

At the same time Mr Theobald records the very interesting observation of *Lucilia caesar* being on occasion the cause of maggot in sheep. Mr Theobald in his letter to me says: "I bred flies myself from maggots taken from some Suffolks in

Year.	Name of Sender.	Locality.	County.
1904	Mr G. Durie . . . .	Oldhamstocks	Haddington
1904	Mr Gordon Shirra Gibb .	Boon	Berwick
1904	Mr G. Durie . . . .	Oldhamstocks	Haddington
1905	Mr Gordon Shirra Gibb .	Boon	Berwick
1905	Mr John Inch, jun. . .	Harburn	Lanark
1905	Mr John Armour . . .	Winchburgh	Linlithgow
1905	Mr William Brown . . .	Banchory	Aberdeen
1905	Mr William Porteous . .	Kinross	Kinross
1905	Mr William Pringle . . .	Dalkerth	Mid-Lothian
1905	Mr Edwin Armstrong . .	Whitehaven	Cumberland
1905	Mr David Reid . . . .	Ballater	Aberdeen
1905	Mr John Armour . . . .	Winchburgh	Linlithgow
1905	Mr Andrew M'Kerral . .	Mid-Calden	Mid-Lothian
1905	Mr William Forrest . . .	Stobo	Peebles
1905	Mr Robert Hogg . . . .	Broughton	Peebles
1905	Mr John Craig . . . .	Innergeldie	Perth
1905	Messrs J. & R. C. Smith .		Roxburgh
1905	Mr James Syman . . . .	Strachan	Kincardine
1905	Mr William M'Turk . . .		Kirkcudbright
1905	Mr John W. Wallace . . .		Dumfries
1905	Mr Edward Armstrong . .	Whitehaven	Cumberland
1905	Mr Arthur Nicholson . . .	Carnaby	York
1905	Mr George Paterson . . .		Roxburgh
1905	Mr George Budge . . . .		Carlisle
1905	Mr J. W. Morrow . . . .	Island Heaghey	Londonderry
1905	Mr William Gardner . . .	Mid-Calden	Mid-Lothian
1905	Mr Andrew M'Kerral . . .	Morton	Mid-Lothian
1905	Mr Walter Barrie . . . .	Sandhope	Selkirk
1906	Mr Gordon Shirra Gibb . .	Boon	Berwick
1906	Mr William Brown . . . .		Elgin
1906	Mr F. H. Sanderson . . .	Nafferton	Northumberland
1906	Mr Finlay Munro, jun. . .	Fearn	Ross
1906	Mr G. Laurie . . . . .		Peebles
1906	Mr William Porteous . . .		Kinross
1906	Mr J. A. McDiarmid . . .	Arichamish	Argyle
1906		Mains of Edzell	Forfar
1906	Mr B. A. Searby . . . .		Lincoln
1906	Mr John Inch, jun. . . .	Harburn	Lanark
1906	Mr J. Barr . . . . .	Gateside	
1906	Mr E. H. Wyly . . . . .		Down
1906	Mr John Bruce . . . . .	Langlee	Selkirk
1906			
1906	Mr John Inch, jun. . . .	Harburn	Lanark
1906	Mr Wm. Brown, M.R.C.V.S.	Elgin	Elgin
1906	Mr John Craig . . . . .	Innergeldie	Perth
1906	Mr Walter Barrie . . . .	Sandhope	Selkirk
1906	Mr William Anderson . . .	Keith	Banff
1906	Mr Gordon Shirra Gibb . .	Boon	Berwick
1906	Rev. Mr Hutton . . . . .	Bothkennar	Stirling
1906	Mr Walter P. Elliot . . .	Galashiels	Selkirk
1906	Mr R. Stewart M'Caig . .	Stranraer	Wigton
1906	Mr Alexander Ogilvie . . .	Ardestre	Forfar
1908	Mr George Smith . . . .	Anchendruive	Ayr

Date of receipt of Maggots.	Sheep affected.	Names of fly bred out.
July 5	Three-quarter-bred lamb	<i>Lucilia sericata</i>
July		" "
August 9	Half-bred lamb	" "
June 19	Half-bred hogg	" "
June 20	Two months' lamb and a three-year-old Blackface ewe	" "
June 20	Blackface ewe	" "
	Pure Leicester two months' lamb	" "
August 2	Early lamb	<i>Lucilia sericata</i> and <i>Calliphora erythrocephala</i>
June 20	Cheviot sheep	<i>Lucilia sericata</i>
June 22	Half-bred Cheviot	<i>Lucilia sericata</i> and <i>Calliphora erythrocephala</i>
		<i>Lucilia sericata</i>
June 26		" "
June 30	Cross-bred Leicester	" "
July 18	Cross Oxford lamb	" "
July 19	Cheviot	" "
August 7	Blackface lamb	" "
August 7	Border Leicester four months' lamb	" "
August 11	Leicester two year-old ram	" "
August 11	Blackface lamb	<i>Lucilia sericata</i> and <i>Calliphora erythrocephala</i>
		<i>Lucilia sericata</i>
August 11		" "
August 13	Border Leicester lamb	" "
August 14	Lincoln and Cheviot ewe	" "
August 16	Three and four months' Cheviot lamb	" "
August 18	Half-bred lamb	" "
August 24	Leicester lamb	" "
August 24		" "
August 24	Blackface sheep	" "
September 23		" "
June 25		" "
July 3	From the back of a horse <sup>1</sup>	" "
August 2	From the foot of a sheep	" "
August 7	Cheviot lamb and five-year-old ewe	" "
August 8	Border Leicester lamb and Border Leicester gimmer	" "
August 9		" "
	Six months' Blackface lamb	" "
	Three-parts-bred lambs	" "
	Lincoln ewe	" "
August 13	Blackface lamb	" "
	Blackface ewe lamb and a ram	" "
August 16	Leicester ewe lamb 19 weeks old	" "
August 26	Oxford lambs six months old	" "
August 27	Half-bred ewe and Suffolk lamb	" "
August 28	Blackface Cheviot	" "
August 30	From back and withers of a two-year-old stirk <sup>1</sup>	" "
September 3		" "
September 3	Cheviot lamb	" "
September 4	Blackface Highland ewes	<i>Calliphora erythrocephala</i>
September 15	Cheviot ewe four years old	<i>Lucilia sericata</i>
September 21	Greyfaced cross lamb	<i>Calliphora erythrocephala</i>
September 25	Cheviot ewe 17 months old	<i>Lucilia sericata</i>
September 28		" "
	Cross Blackface and Leicester	" "
October 2		<i>Calliphora erythrocephala</i>

<sup>1</sup> See note that follows.

Huntingdonshire; the sheep were grazing near a wood where *L. cæsar* was common. I have also taken *L. cæsar* from live sheep close to the river at Wye, Kent."

There are statements in the literature that *Lucilia cæsar* lays occasionally in the wounds of men and animals, but Mr Theobald's record is the only authenticated one I know concerning attack on sheep. I believe that *Lucilia cæsar* is typically and by habit a scavenger laying in carrion, and not a parasite laying on live sheep, whereas *Lucilia sericata* is now by habit a parasite.

Some lean to the opinion that *Lucilia sericata* was originally a coprophagous species—laying in dung, but it is more likely that the fly has changed from laying on dead carcasses or carrion to laying on live animals. Indeed, I agree with Carpenter<sup>1</sup> when he says, "The maggots have become parasites instead of scavengers," over a limited area at least. "This change of habit has been induced by the domestication of sheep by man. We have taken an originally alpine race of animals, crowded them on the plains, and by artificial selection increased the qualities that tend to attract the fly. Moreover, the comradeship of sheep with man has rendered them more helpless than most of our domestic animals." If the limits of this report allowed, it would be easy to multiply illustrations from both the animal and plant worlds as to change of food habits or the spread of diseases as a result of domestication, and in general of man's agency.

#### *Old and Odd Views of Natural History.*

Quaint views were held in the past as to the origin of insects. Some taught that they fell from the sky, others that they sprang from moist heat. James Hogg, the Ettrick Shepherd, in 'The Shepherd's Guide' of 1807, declares that the sheep maggot never becomes a fly. It was interesting in connection with the maggot inquiry to find, in the endeavour to procure maggots, people absolutely refusing to believe that the maggot had anything to do with a fly. Much of the mistake is due to faulty observation, examples of which occur every day. Kingsley in his 'Water Babies' makes the issue of the adult dragon-fly take place under water; Eliza Cook has "blue-moths" flitting by in her poems; the illustrated evening press of the day in Edinburgh draws blue-bottles with four wings; while even such an excellent observer and delightful cartoonist as Sir F. C. Gould—never more delightful than when making use of Natural History subjects—draws wonderful semi-looper caterpillars, and provides spiders with antennæ.

<sup>1</sup> 'The Economic Proceedings of the Royal Dublin Society,' vol. i., part 3, page 140.

THE BLUE-BOTTLES (*Calliphora*).

The characters of the genus *Calliphora* have been given already. The two species may be here contrasted:—

*Calliphora erythrocephala*, Mg.

The parts below the cheeks and the eyes are red, with black hairs; or, put generally, the cheeks are red and the beard is black.

*Calliphora vomitoria*, L.

The parts below the cheeks and the eyes are black, with red hairs—i.e., the cheeks are black and the beard is red.

That *Calliphora erythrocephala*, one of the blue-bottles, may also strike sheep is undoubted. Mr Newstead and Mr Theobald have both bred out this *Calliphora* from maggots taken from live sheep, and it will have been noticed that in my experiments *Calliphora erythrocephala* appeared on six occasions—three times along with *Lucilia sericata* and three times by itself.

The rarity of the appearance of *Calliphora erythrocephala* in the foregoing table is interesting in view of the strong belief on the part of flock-masters and shepherds that the blue-bottle is a common enemy of the sheep. It is often said that this blue-bottle is the earlier maggot, but my first record of *Calliphora erythrocephala* bred from maggots on sheep is June 22. Certainly, apart altogether from sheep, *Calliphora erythrocephala* does not disappear in early summer, but continues on the wing all through the summer on to the autumn. In late August and September I never had difficulty in procuring specimens of *Calliphora erythrocephala* for experiment, and indeed have bred it out as late as November from maggots taken in the open. I obtained on October 2nd maggots from a live sheep, and from them bred out *Calliphora erythrocephala*.<sup>1</sup> Still, it will be shown here that *Calliphora erythrocephala* is very typically a carrion-feeder.

*Calliphora erythrocephala*.

The following is a description, after Lowne,<sup>2</sup> of this blue-bottle (fig. 19):—

The fly measures from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in length, and up to and over an inch in spread of wings. The males are somewhat smaller than the females, but their compound eyes are larger (fig. 20). The head is black, but the space between the proboscis and the antennæ may be brown; the cheeks are red or yellow, and the

<sup>1</sup> One of my students took well-grown maggots on December 5, 1908, while snow was lying on the ground, from some sheep-skins hanging in a shed, in Dumfries. These maggots unfortunately were destroyed before they reached me, and the species is therefore uncertain.

<sup>2</sup> 'The Blow-Fly,' by B. Thompson Lowne, F.R.C.S., F.I.S. Two volumes. London, 1890-92.

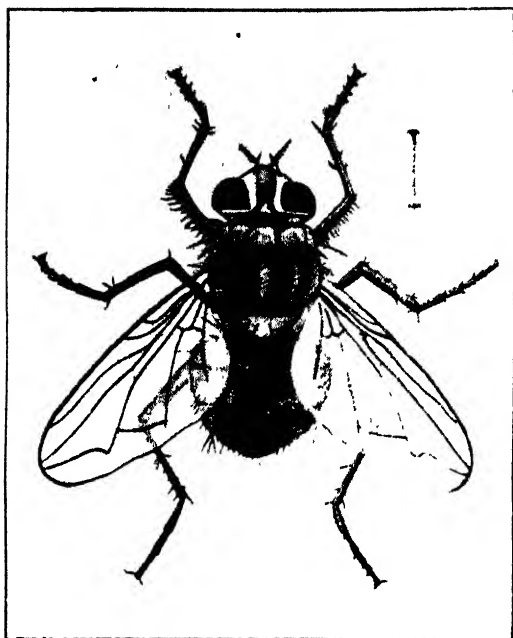


Fig. 19 — *Calliphora erythrocephala*. (After Howard.)

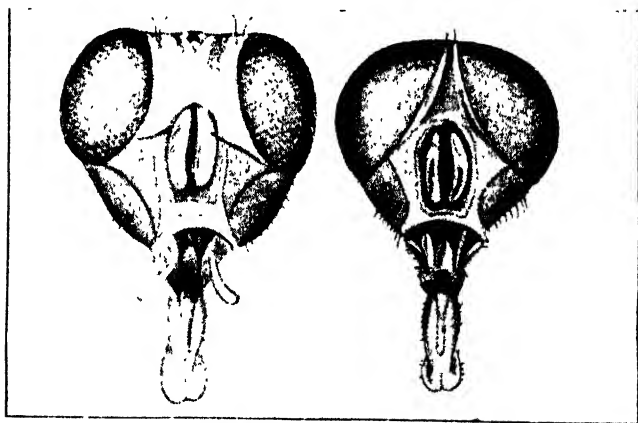


Fig. 20.—*Eyes of Calliphora*. (After Lowne.)

1. Anterior view of head of adult female of *Calliphora erythrocephala*. 2. Anterior view of head of adult male of *Calliphora erythrocephala*.

beard is black. The back of the head and the sides of the forehead may have a silvery pubescence. The forehead—between the eyes—is narrow and triangular in the male, and broad

and trapezoidal in the female. There are three simple eyes, on the top of the head between the compound eyes, arranged in the form of a triangle; these simple eyes are partly hidden by hairs. In a hollow in the centre of the lower part of the face lie the antennæ, each antenna having a plumed bristle. The mouth parts have no functional piercing organs; the tube-like labium is flattened out at its apex into a two-lobed structure which has a rasping function; the hollow tube is used in sucking up liquids or what has been dissolved by the saliva.

The thorax is blue-black, with whitish pubescence on each side. The abdomen is deep metallic-blue with a whitish pubescence.

The mesothorax—greatly developed in comparison with the prothorax and the metathorax—carries the fly's wings, with two lobes at the base of each—the alulæ or winglets—and a hood-like squama; the small metathorax has on each side a tiny drumstick-like or clubbed organ, the haltere or balancer.

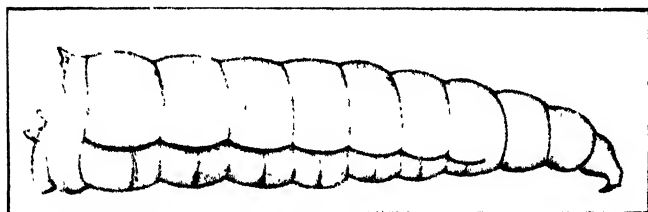


Fig. 21.—*Adult larva of Calliphora erythrocephala.*

Magnified (After Lowne)

The egg measures only about 1 millimetre; it is oval in shape; one surface is convex, the opposite one flat or somewhat concave. Under high magnification the shell is seen to have a honeycomb-like pattern with punctures.

The larva (fig. 21) is a maggot with pointed head-end, the hind end being obliquely truncate. The diameter of the segments increases from in front backwards. The skin is smooth except that where each segment is constricted off from the next there is a number of small recurved spines or hooks made use of in crawling. The mouth has two horny hooks used in feeding, and aiding in progression; a third middle hook is present in the earliest stage of the maggot; the head can be retracted into the thorax.

The first segment behind the head has on each side a stalked fan-shaped spiracle with thirteen prominences or orifices. A second and far more important pair of spiracles lies on the upper half of the obliquely-truncate hind end of the body. Each of these spiracles is situated on a horny plate and has

three slits, the slits being protected by a horny network. On the lower half of the posterior face of the last segment is the anus, on each side of which is a process of service in locomotion.

The puparium consists of the last-moulted skin of the larva; it is at first yellow, but soon is red, and it may turn almost black. Under cover of this puparium the changes take place which result in the development of the mature fly.

### *Life-history.*

The eggs are laid on flesh, fresh or putrefying. A large number of eggs is laid—from 400 to 600—in little heaps or clusters, the number in each cluster varying greatly. In suitable temperature the eggs hatch by twenty-four hours. The larva tunnels in the carrion, but on a live sheep is more a surface-feeder than the maggots of *Lucilia sericata*, often at most just breaking the skin. The length of time spent in the feeding larval condition varies with the environment, but in very favourable conditions it may not be longer than just over a week, although the time is often greater.

In the growth of the larva several moults take place. The moults are accompanied by a modification in mouth parts and by changes in the posterior spiracles; these spiracles in the early stage of the larva have each one slit, two slits in the second stage, and three finally. When full-grown the larva leaves the carrion or falls away from the live sheep and may enter the soil. The last larval skin is moulted, the head of the maggot is retracted, the alimentary canal emptied, the larval organs degenerate and are replaced by organs that will be of service to the adult—there is, in a word, a complete reconstruction. If one break open the puparium when its dark colour has been assumed, then, in place of the creamy fluid characteristic of the earlier stage of pupation, the pupa will be found whitish in colour, and with proboscis, wings, and legs lying along its under surface.

The length of the pupal stage varies according to the temperature. When the fly is ready to escape, the frontal sac—a bladder-like structure on the forehead—is inflated. This presses against the front rings of the pupa-case, which opens in lid-like fashion, and the fly emerges. When first seen the newly-emerged fly is soft and has crumpled wings, and lacks the blue colour. In a few hours, however, the characteristic appearance of the fly is attained. There are several generations in the year. Hibernation may take place as adult or in the puparium condition.

*Calliphora vomitoria.*

This second species of blue-bottle has to the naked eye a close resemblance to the last. It measures  $\frac{1}{4}$  inch or over in length. The colour is black with a glossy blue. The eyes are red-brown; the cheeks are black and the beard red.

Egg, larva, and puparium resemble those of *C. erythrocephala*. *Calliphora vomitoria* lays its eggs on the flesh of dead animals—raw or cooked, fresh or putrefying. There are statements in the literature of the flies having laid in wounds and ulcers. There is no doubt, however, that typically this fly is a carrion-fly.

The life-history resembles that of *Calliphora erythrocephala*.

*Breeding Experiments with Blue-bottles.*

Unless otherwise stated, the method of experiment was to imprison for a short time the blue-bottles with fresh uncooked mutton, and to isolate such mutton on the eggs having been laid. The isolated meat, protected by a bell-jar, so that no other flies could gain access to the meat, was kept in an open tent in a garden. The meat was laid on soil into which the larvæ could go when full grown for pupation. Both species of blue-bottle were found to lay quite freely under the conditions stated, and after the full-fed maggots had pupated the flies were bred out in due course.

## CALLIPHORA ERYTHROCEPHALA.

Number of Experiment.	Time.	Egg stage.	Larval stage.	Puparium.	Total length of cycle
1	Aug. and Sept.	1 day	10 days	18 days	29 days
2	" "	1 "	8 "	19 "	28 "
3	" "	...	...	...	29 "
4	" "	...	...	...	33 "
5	" "	...	...	...	31 "
6 <sup>1</sup>	{ Sept. and beginning of October }	1 day	11 days	21 days	33 "

CALLIPHORA VOMITORIA.					
1	Aug. and Sept.	1 day	12 days	19 days	32 days

<sup>1</sup> The beef offered in this case to the flies for egg-laying had been boiled.

*Experiments with Carrion.*

In order to get some information as to what flies might lay in carrion in the open, one of my students, Mr John Armour,—a thoroughly interested and capable observer,—placed in selected spots in the country the following animals, whose dead carcases were allowed to lie exposed until struck by some fly:—

Sparrow.  
Starling.  
Blackbird.  
Chicken.  
Mole.  
Rat.

When maggots were noticed the carcase was protected, the maggots being allowed to complete their growth. The puparia from each animal were kept separate. These were sent to me, and in every case the flies that bred out were *Calliphora erythrocephala*. I myself bred the flies out from maggots in a dead mouse, and also those from a dead fox, the last material being kindly sent to me by Mr J. Glendinning, Auchtertool, and in these two cases also the flies proved to be *Calliphora erythrocephala*.

*Parasitic Braconidæ.*

It was very interesting to find that a certain number of these blue-bottle maggots were parasitised. A Hymenopterous parasite—one of the Braconids—had laid its eggs in the fly maggots which were destroyed by the larvæ of the parasite.

From maggots of *Calliphora erythrocephala* taken from a mole, a starling, and a sparrow, I bred out the Braconid parasite *Alysia manducator* Panz., both males and females.

The Braconidæ is a sub-family of Hymenoptera containing many parasites of small or moderate size, and differing from the closely allied sub-family Ichneumonidæ in the venation of the forewing and in the comparative lack of mobility of the segments of the abdomen. The adult female Braconid lays her eggs in the body of some insect—e.g., a caterpillar or an aphid,—and the Braconid larva on hatching feeds at the expense of the host, ultimately crippling it so that the parasitised host fails to complete its development or life-history. A common Braconid, *Apanteles (Microgaster) glomeratus*, is very destructive to the caterpillars of the second brood of the large cabbage white butterfly, while other species do much to lessen the numbers of green-flies.

Many of the Braconids belonging to the section Alysiidæ

prey upon Diptera, and the species *Alysia manducator* Panz. has up till now been recorded as parasitic on the larvæ of the following flies: *Lucilia cæsar*, *Cyrtoneura stabulans*, *Hydrotæa dentipes*, and on the grub of the beetle *Creophilus maxillosus* a feeder on carrion. I believe the present record of *Alysia manducator* from the *Calliphora erythrocephala* is the first for this fly. I am indebted to the kindness of Mr Claude Morley for the determination of the *Alysia*.

#### COPROPHAGOUS SPECIES.

##### *Myiospila meditatunda*, Fab.

This dung-frequenting muscid measures  $3\frac{1}{2}$  to 4 millimetres in length. In the males the compound eyes are close together, a distinct space being left between them in the females. The upper surface of the thorax is black, with four longitudinal stripes; the scutellum is grey-brown. The abdomen is yellowish sprinkled with grey; there are two black-brown spots close together on the upper surface of the second and third rings, and on the first ring only vestiges of spots. In the female these spots on the abdomen are lighter than in the male; they are often not well marked, and in individual specimens may be absent. The antennæ are brown, and the proboscis and feet black. The wings are pale-brown dusted with grey; the base and fore edge of the wings, and sometimes—especially in the female—the neighbourhood of the veins, are intensive brown.

The eggs are described by Portchinski<sup>1</sup> as large in size for the size of the fly, and with a short curved appendage and a black stripe along the under surface of the egg. The same author notes that a small number of eggs is laid—not more than twenty-four; and that in the development of the larva there is a missing out of the second stage,—such as will be mentioned for *Musca domestica*,—the consequent shortening of the larval life and of the life-cycle being a compensation in the competition with other dung-infesting species that lay a large number of eggs but take a longer time for the completion of the life-cycle. In my experiment with *Myiospila meditatunda* the life-cycle was not passed through—in comparison with other dung-infesting species—very rapidly, but the experiment was late in the season, and this would tend to lengthen out the life-cycle.

The newly excreted dung of a pony was allowed to remain exposed in open field from 5.30 P.M. to 8.30 P.M. on August 29, 1907, during which time it was visited by *M. meditatunda*.

<sup>1</sup> C. R. Osten-Sacken on Mr Portchinski's publications on the larvæ of Muscidae. Berlin Deutsch Entom. Zeit., vol. iii., 1887.

This dung was then placed in an outhouse out of the sun and covered with a bell-jar. The first *Myiospila* came away on September 30, and two others on October 1—a period of thirty-two days having been occupied in the life-cycle.

Wingate records the fly as occurring at Durham in April, so that the species seems to be found from spring onwards to the autumn.

Of greater importance than *Myiospila* are *Stomoxys calcitrans* and *Musca domestica*. In the last year or two excellent and most useful work has been done by various workers on these species, and as new facts have been brought to light in regard to life-history and habit, I give here a general description of these flies.

*Stomoxys calcitrans*, L.

This fly (fig. 22) measures over a quarter of an inch in length and half an inch in spread of wings. The face between the brown eyes is whitish with a yellow tinge; the antennæ and

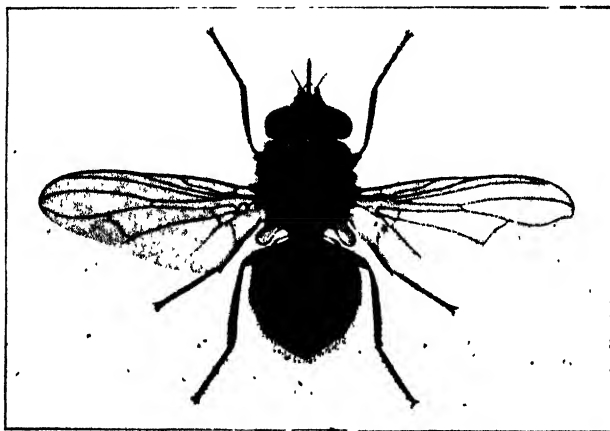


Fig. 22.—*Stomoxys calcitrans*.

Female magnified. (After Austen.)

proboscis are brown; the thorax is greyish with two dark stripes and dark spots; the abdomen is greyish-yellow brown, all the joints but the last having two brown spots. The wings are glassy.

In the female the space between the compound eyes is double the breadth of the same space in the male.

Besides being somewhat shorter and stouter than *Musca domestica*, the eyes of *Stomoxys* are not so red; the wings, too, when *Stomoxys* is at rest, are held wider apart and the head

is more erect, while the piercing proboscis projects in front of the head. *Stomoxys calcitrans* is found in Britain from north to south, in summer and early autumn.

The fly may be seen in the open resting on gates and rails in pastures and in farmyards and stables. It enters houses previous to rain or a storm, when man may be bitten. Theobald<sup>1</sup> writes: "This fly is said only to approach houses and enter them previous to a storm and in late autumn. This is nearly always the case, and I have noticed that they appear hours before the storm approaches or any indication in the barometer." Howard<sup>2</sup> traces to this habit the old saying, "Flies begin to bite before a rain."

In stables where the flies bite the horses' legs a swelling follows the wound, especially in sensitive, fine-skinned animals. Cattle also can suffer, Austen<sup>3</sup> quoting a case mentioned by Mr T. J. Bold in the 'Entomologists' Monthly Magazine,' vol. ii., 1865, where a veterinary surgeon had fourteen cows under treatment for the bites: "The animals were generally bitten on the outside of the legs, on the shoulders, and, in rare cases, on the neck. In some of the severe cases the joints were so much swollen that the poor animals could not bend their legs to lie down, and in them the inflammation rose so high as to cause the loss of the outer skin and hair. The veterinary surgeon did not suffer from the bites upon his hands."

Mr Robert Newstead, of the School of Tropical Medicine, The University, Liverpool, has given in Volume I. of the 'Journal of Economic Biology' an account of his observations and experiments on *Stomoxys calcitrans*. He observed the flies laying their eggs in September in a heap of grass mowings, and numerous larvæ and pupæ were found in the same place. Females kept in captivity laid their eggs on fresh fæces of the horse, sheep, and rabbit, and "an almost complete absence of light and abundance of sunshine" were necessary conditions for the development of the larvæ.

The eggs are laid in heaps; they are elongate, curved on one side and flat on the other.

The larva is a legless maggot, whitish-yellow in colour, with two mouth-hooks, two yellowish prothoracic spiracles, and two black posterior spiracles. Full-grown the larva measures half an inch.

The puparium is red, but later dark-brown; it measures one-quarter of an inch or just over.

Newstead's summary of the life-cycle is as follows:—

<sup>1</sup> Economic Zoology. Second Report. Brit. Mus. Nat. Hist., 1904, p. 14.

<sup>2</sup> 'The Insect Book,' by Dr L. O. Howard, p. 169.

<sup>3</sup> 'The British Blood-Sucking Flies,' by E. E. Austen, British Museum, p. 59.

*Larvæ fed on Moist Sheep's Dung.**Eggs procured from Captive Females.*

Average day temperature . . . . .	72° F.
Average night temperature . . . . .	65° F.
Month . . . . .	August.
Eggs—Incubation period . . . . .	2 to 3 days.
Larval stage . . . . .	14 to 21 „
Pupal stage . . . . .	9 to 13 „
Complete cycle . . . . .	25 to 37 „

*Food allowed to be Partly Dried and some Light admitted.*

Temperatures and month as above.

Ova—Incubation period . . . . .	2 to 3 days.
Larval stage . . . . .	31 to 78 „
Pupal stage, approximately as above.	
Complete cycle . . . . .	42 to 78 „

*Other Blood-suckers.*

Related to *Stomoxys* is the genus *Hæmatobia*, the flies of this genus being also blood-suckers. The *Hæmatobia* flies do not live under cover, but in the open pastures, where, in freshly-excreted dung, the eggs are laid and the larval life is passed. These flies have the arista—as in *Stomoxys*—plumed on the upper side only, and they have the proboscis projecting in front of the head. A characteristic of the genus is that the palpi (short in *Stomoxys*) are long, forming somewhat of a more or less complete sheath for the proboscis.

*Hæmatobia stimulans*, Mg. (fig. 23), is described by Austen<sup>1</sup> as occupying a position intermediate between *Stomoxys calcitrans* and *Hæmatobia (Lyperosia) irritans*. “The head in both sexes is very much smaller than in *S. calcitrans*, and the eyes of the male much closer together, being only narrowly separated.” The palpi are not as long as the proboscis, and are orange-coloured. This species is found in Britain from north to south.

*Hæmatobia (Lyperosia) irritans*, L. (fig. 24).—This is a small muscid, measuring only from  $3\frac{1}{2}$  to 4 millimetres in the male, and  $4\frac{1}{2}$  to 5 millimetres in the female ( $\frac{1}{16}$  of an inch). It differs, too, from the last species in having the palpi practically as long as the proboscis, and these palpi are black or have dark margins and tips. This fly was introduced to America about 1886, and in the United States and Canada has proved a very troublesome enemy of cattle. In these countries a common name for the

<sup>1</sup> ‘The British Blood-Sucking Flies,’ by E. E. Austen, p. 59.

fly is the Horn-fly, from the habit which the flies have—when in swarms—of settling and resting in clumps and forming a band at the base of the horns of the cattle. In the American

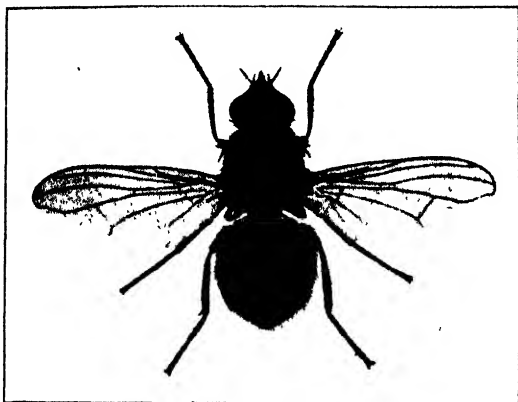


Fig. 23.—*Hæmatobia stimulans*.  
Female magnified. (After Austen.)

literature this fly has the further name of *Hæmatobia serrata* (Rob-Desv).

It is an enemy of cattle. Howard and Riley have described the fly and its habits in the United States.<sup>1</sup> When the fly is



Fig. 24.—*Hæmatobia (Lyperosia) irritans*.  
Female magnified. (After Austen.)

resting, the wings are flat on the back, slightly apart at the tips; but when feeding, with proboscis sunk below the skin of the host, the wings are somewhat raised and held out from the body, "approaching approximately an angle of 60° from the

<sup>1</sup> 'Insect Life,' ii., 1889, p. 93.

abdomen." Favourite places for settling on the cattle and for feeding are the back, flanks, and legs, and when the animals are lying down, "under the thighs and back-belly." In rain or storm the flies collect on the under side of the animal.

The eggs are laid singly in fresh cow-dung. The larvæ on hatching tunnel through the dung. When full-grown the maggots reach a length of a quarter of an inch; they pass into the soil below the dung for pupation. The life-cycle in favourable conditions can be passed through in three weeks, so that there can be several generations in the year.

In the United States measures are taken against the fly so as to deter it, by unpleasantly smelling dressings, from visiting the cattle, or by spraying to kill the flies on the cattle. To destroy the larvæ, the dung is either treated with lime or it is spread out in dry weather by implements, in order that in the sun-dried dung the larvæ may be unable to complete their development.

#### THE COMMON HOUSE-FLY<sup>1</sup> (*Musca domestica*, L.)

Although several species of fly (fig. 25) are found in our houses, this is far the commonest. It is found from the summer onwards to the autumn. It varies in length from one-quarter of an inch to about three-eighths of an inch.

The general colour is dark ash-grey. The skin itself is black, but the grey appearance is due to a dusting of grey; where this dusting is wanting the black is seen. Thus four black longitudinal lines are seen down the back of the thorax; these lines fail at the little shield at the hind end of the thorax (*scutellum*), which is grey. The abdomen has a grey-spotted or chequered appearance, is pale or yellowish at the base and on the under surface, and has a dark streak down the middle of the upper surface.

<sup>1</sup> There are numerous references to and accounts of *Musca domestica* in the literature. Apart from Taschenheig's 'Praktische Insektenkunde,' part iv., pp. 102-107 (1880), recent works are "A Contribution to the Study of the Insect Fauna of Human Excrement" (with special reference to the Spread of Typhoid Fever by Flies), by Dr L. O. Howard, in 'Proc. Wash. Acad. Sciences,' vol. ii. p. 541; "House-Flies," revised edition, Circular No. 71, U.S. Dep. of Agric., by Dr L. O. Howard; "House-Flies and their Ways at Benares," 'Journal of Royal Army Med. Corps,' vol. ix. p. 150 and p. 447, by F. Smith; "Life-History of House-Flies," 'Public Health,' vol. xxi. p. 122, by A. Griffith; "On the Habits, Life-Cycle, and Breeding-Places of the Common House-Fly (*Musca domestica*, Linn.)," by Robert Newstead, M.Sc., A.I.S., F.E.S., in 'Annals of Tropical Medicine and Parasitology,' vol. i., No. 4, Feb. 1908; and the first two parts of a fine Monograph on *Musca domestica*, by C. Gordon Hewitt, M.Sc., University of Manchester, viz., "The Structure, Development, and Bionomics of the House-Fly" (*Musca domestica*), Part I., The Anatomy of the Fly, 'Quart. Jour. Micr. Sc.,' vol. 51, p. 395, &c., and Part II., "The Breeding Habits, Development, and the Anatomy of the Larva," 'Quart. Jour. Micr. Sc.,' vol. 52, part 4, October 1908, p. 495, &c.

The face is whitish. The eyes are large and red. The arista—the bristle on the third joint of the antennæ—is hairy on both sides right to its lip.

The proboscis is soft, being incapable of piercing or stinging.

The egg is white in colour and elongate oval in shape, one end being more pointed, the posterior end rounder. Under high magnification a hexagonal pattern is seen on the shell.

*Larva.*—The larva is a white or grey-white maggot, pointed at the head end, and blunt behind. Each of the last eight segments of the body has on the under surface at its front margin a rough or spiny area. In the course of its growth the larva moults twice, and thus three stages are to be distinguished.

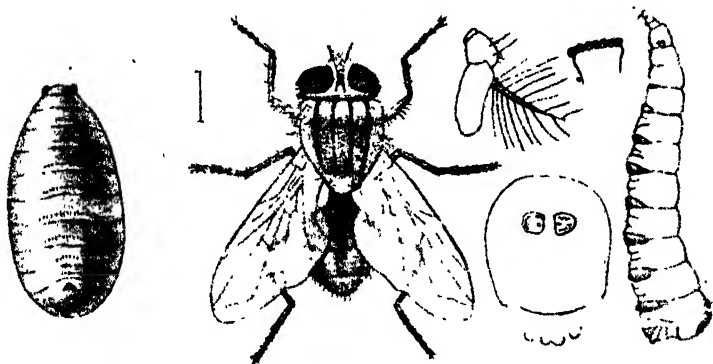


Fig. 25.—*Musca domestica*.

Adult fly; larva; puparium; antenna of fly; fan-shaped spiracle; posterior spiracles.  
(After Howard.)

In the first stage two small projecting plates may be found on the posterior face of the last segment, each of these having one respiratory slit. Mouth-hooks are present. This stage is ended by the first moult, this moult taking place soon. Hewitt gives the time as "usually from twenty-four to thirty-six hours after hatching," but "under unfavourable conditions with regard to the factors governing development, the first larval instar sometimes lasted three or four days."

The larva in the second stage has a pair of fan-shaped spiracles on the segment behind the head, each of these spiracles consisting of a projection bearing six or seven knobs or rays. In a favouring temperature the second moult may take place in twenty-four hours, but this period can easily be exceeded.

The larva, now in its third stage, has still the anterior spiracles; the horny plates of the posterior spiracles are larger, and the respiratory openings rounded. The full-grown maggot measures three-eighths of an inch.

The Puparium is rounded oval or barrel-shaped; the colour at the very beginning is yellow, and then red, and ultimately dark-brown.

### *Life-history.*

The female lays on an average 120 eggs or more at the one time, and this egg-laying is repeated several times by the same female. The favourite place for egg-laying is horse manure.

Newstead, in a survey of five areas in different parts of Liverpool, examined the refuse of over three hundred ashpits and thirty-seven midden-heads, and in his report writes:—

“I. The chief breeding-places of the house-fly are—

- (a) Stable middens containing fermenting horse manure, or a mixture of this and cow-dung.
- (b) Middens containing spent hops.
- (c) Ashpits containing fermenting vegetable matter.

II. The covered ashpits and middens were as badly infested as those that were open.

III. That house-flies breed in all temporary collections of fermenting matter.

IV. That house-flies breed in relatively small numbers in ashpits where no fermentation takes place.

V. That very dry or excessively wet ashes or moist cow-dung does not harbour them.”

Hewitt, in the Summary of Part II. of his Monograph, names, from the literature and from his work, the various places in which eggs may be laid: “Horse manure; human excrement; cow-dung; poultry excrement; in substances contaminated with excremental products, such as bedding from piggeries and from rabbits and guinea-pigs; paper and textile fabrics which have been contaminated, as cotton and woollen garments, sacking, rotten flock-beds, straw-mattresses; cess-pools; decaying vegetable substances; rotten fruit—*e.g.*, bananas, apricots, cherries, plums, peaches, and melon slices; in spent hops; in waste foodstuffs—*e.g.*, bread moistened with milk, boiled egg, broth; bad meat and dead animals.”

In favourable environment the eggs hatch in eight to twelve hours, and when growth is completed pupation takes place under cover of the last larval skin. In the pupal stage, Hewitt has shown that the fly up to the time of its exit obtains its necessary oxygen by means of a “pair of temporary pupal spiracles which appear as minute spine-like lateral projections between the fifth and sixth segments of the pupal-case.”

The fly, when ready, breaks the anterior end of the puparium by means of an inflated frontal sac which, protruded in front of the head, is pressed against the inside of the puparium. This frontal sac is also of service in aiding the fly to reach the open through the manure or other material in which the puparium has been lying. The wings then expand.

Although the fly does not grow any—once the winged state is assumed—it is not yet sexually mature. Hewitt states 10 to 14 days from emergence of the fly as the time before sexual maturity is attained.

The length of time taken for a complete cycle from egg to emergence of fly varies considerably, a high temperature and fermentation in the material in which the maggots are feeding, being important favouring factors.

Packard, in America, found the cycle could be completed in 10 to 14 days; Howard, in his experiments, found 10 days sufficient for the cycle; Hewitt, in experiment, found 20 days, 24 days, 30 days as times taken. It may be stated, however, that in favouring conditions a fortnight can be sufficient for the completion of the cycle. Yet changeable weather and low temperature and unsuitable food lengthen out the cycle for far longer periods.

#### *Dangers due to the House-fly.*

Domesticated animals are plagued by these flies when the flies are present in great numbers; but it is as a menace to the health of human beings that we would denounce the house-fly and argue for a campaign against it.

That danger may attend the presence of the house-fly is clear from much evidence that these insects can and do carry infection to milk and comestibles. It is not pleasant to reflect that these house-flies may have come directly from filth or garbage, and that germs of disease attached to their hairs or voided in their excrement can be deposited on meat, or confectionery, or fruit, or eatables generally, or be washed off into milk, where the germs may multiply and be the cause of disease.

Such infective matter carried to milk—that not uncommon grave of flies—can in the summer-time, when flies are abundant, be responsible for the prevalence of summer diarrhoea in children, so baneful in result. A high percentage of the deaths of children from infantile diarrhoea is due to infection conveyed by house-flies.

The spread of typhoid fever has in well authenticated cases been proved to be due to the carriage of the bacillus of typhoid by house-flies. The bacillus of consumption can also be carried

by the fly, not only externally attached to hairs on its body but also internally, the bacilli after being voided not having lost their virulence.

Experimentally, too, it has been shown that where flies were fed on cultures of the cholera germ, the germs were found up to four days later in the intestines of the flies and in their excrement. The germ of anthrax may also be carried.

### *Protective Measures.*

Protect exposed comestibles by means of gauze.

Do away with exposed heaps of stable manure, and arrange that such manure be in closed receptacles.

Howard found that chloride of lime applied to manure piles destroyed the maggots. He recommends the regular cleaning out of stables, and each time that a day or two's accumulation is added to the pile a shovelful of chloride of lime should be thrown over it. Paraffin sprinkled over the refuse kills the grubs.

The winner of a £400 prize offered by the Paris newspaper, 'Le Matin,' for the best description and mode of fighting the house-fly, recommended the use of the thick residuum left behind after the distillation of crude shale (schist) oil. This shale oil was stirred up with its own volume of water. Two litres of the oil would serve to dress a square metre of cesspool or dung. In connection with dung-heaps, the author declares that excellent results will be obtained by mixing the oil with soil and scattering layers of this at intervals during the summer over the dung-heap.

Fowls take the larvæ greedily.

### *Musca corvina*, F.

This species is somewhat larger than *M. domestica*, and is not usually found indoors, but has been taken. It breeds in dung. The differences between *M. domestica* and *M. corvina* may be shown in parallel columns<sup>1</sup>:—

#### *M. domestica.*

Eyes of male separated by about the fourth of the width of the head.

In the female the frontal stripe is narrow in front, but widening out on the top of the head between the eyes, so as to blot out the white eye-borders.

#### *M. corvina.*

Eyes of male almost touching.

In the female the frontal stripe is rather narrow, with parallel sides which do not blot out the white eye-margins on the top of the head between the eyes.

<sup>1</sup> See 'Durham Diptera,' by Wingate, p. 240, and 'House, Garden, and Field,' by L. C. Miall, p. 106.

*M. domestica.*

Four longitudinal dark streaks on the upper surface of the thorax, which are not continued upon the scutellum (a grey semicircular shield at the hind end of the thorax).

Abdomen yellowish at the base and over a great part of the under surface.

Common in houses.

*M. corvina.*

Four longitudinal dark streaks on the upper surface of the thorax, which are continued on the scutellum.

Abdomen of male yellowish.  
Abdomen of female dark grey.

Found on walls round stables and in the open.

The full grown larvæ of these two species greatly resemble one another, but the anterior spiracles of *Corvina* larvæ have 12 knobs or rays.

*The Family Anthomyiidae.*

The Anthomyiidae is a large family of common flies, that suggest *Musca domestica* more or less. The fourth longitudinal vein, however, is not bent upwards, but runs straight, or almost straight, to the margin. The arista in some cases is plumed, in others naked. Some species are very troublesome in agriculture—e.g., the cabbage-root fly. Two species that are found in houses, and whose larvæ live in dung, are *Homalomyia canicularis*, L., and *Homalomyia scalaris*, F.

*H. canicularis* is smaller than *M. domestica*; the arista is not plumed; the fly is also paler, and the abdomen more pointed; there is a difference also in the venation of the wings. The males are the commonest, and have pale patches at the base of the abdomen. Miall writes of this fly: "The mode of flight is peculiar. Sometimes we remark only a slight movement to and fro just beneath the ceiling, but at other times in hot summer weather the flies execute a peculiar evolution which enables us to identify them. One darts at another, and after a sort of hasty kiss the two fly off in different directions."

*H. scalaris* is also smaller than *Musca domestica*. Newstead found the larvæ in ashpit refuse and in human feces.

*The Family Sarcophagidae.*

This is a family of flies not far removed from the Muscidae, and distinguished from Muscidae inasmuch as the arista or bristle of the antennæ, while feathery at the base, is hair-like and fine at the tip.

*Sarcophaga carnaria.*

Our best-known species is *Sarcophaga carnaria*, the grey flesh fly. This fly measures up to half an inch and over in the case of the female, the male being smaller. It is a greyish-looking hairy fly with glossy head. The upper surface of the thorax is whitish-grey, with longitudinal black stripes. The abdomen has a series of black-and-white checks.

The fly is viviparous, laying not eggs but live maggots in the dead bodies of animals or in stored stocks of flesh. In the literature the maggots are said to be laid sometimes in clean wounds of men and animals and in ulcers; in the nasal cavity and the anus of animals; and occasionally in the generative openings of horses, cows, and swine. The maggots are white-coloured, with the upper surface markedly granulated. The puparium is black-brown. Bos says that there may be three generations in the year.

*Cynomyia mortuorum.*

Another fly of the family is *Cynomyia mortuorum*, L., whose larvæ live in putrefying flesh.

The abdomen is shining blue; the cheeks and the parts below the cheeks and the eyes are bright orange.

This fly is oviparous. Portchinski in his experiments found that the larvæ thrive well on meat that was offered them. Portchinski, working in Russia, states that this fly is most abundant in spring, the numbers being greatest from the middle to the end of May, after it gives way before the competition of the *Calliphoras*. Portchinski's work led him to the opinion that *Cynomyia* laid, it might be, only a quarter as many eggs as *Calliphora*, and therefore had its best chance as an early fly before *Calliphora* appeared in numbers. In my experiments with carrion, from June onwards, I did not at any time get *C. mortuorum*. The fly, however, is not confined to the spring months in Britain—I am not able to say whether its numbers are greatest then—for, in the collection at the Royal Scottish Museum, there are records of *Cynomyia mortuorum* from April onwards to and including September, and one of the late records is from the north.

## MILK RECORDS.

By JOHN SPEIR, Kt. St O., Newton.

## SIXTH SEASON—RECORD OF 8132 COWS.

THIS work, which had been carried on by the Society for the five years 1903-7, was at the end of 1907 transferred to the Ayrshire Cattle Milk Records Committee. This body has supervised the work during the past season, and supplied the materials from which this report is compiled. For the past year the members of the committee were as follows:—

Name and address.	Representative of
Mr Alex. Cross of Knockdon, 19 Hope Street, Glasgow	Highland and Agricultural Society.
Mr John Speir, Kt. St O., Newton, Glasgow	
Hon. G. R. Vernon, Auchans, Kilmarnock	
Mr Charles Douglas of Auchlochan, Lesmahagow	
Mr James Howie, Hillhouse, Kilmarnock	Ayrshire Cattle Herd-Book Society.
Mr Matthew Hunter, Adamhill, Craigie	
Mr Robt. Lees, Lagg, Ayr	
Mr T. C. Lindsay, Aitkenbrae, Monkton	
Mr A. W. Montgomerie, Lessnessock, Ochiltree	
Mr H. W. B. Crawford, Chapmanton, Castle-Douglas	Stewartry Milk Record Society.
Mr John Douglas, Barstibbly, Castle-Douglas	Kirkcudbright Milk Record Society.
Mr James Dunlop, Hall House, Fenwick	Fenwick Milk Record Society.
Mr Gavin Hamilton, Banker, Lesmahagow	Lesmahagow Milk Record Society.
Mr W. T. R. Houldsworth, Kirkbride, Maybole	Carrick Milk Record Society.
Mr Thos. Howie, Fairfield Mains, Monkton	Central Ayrshire Milk Society.
Mr John M'Caig, Challoch, Leswalt	Leswalt and Kirkcolum Milk Record Society.
Mr James Moffat, Gateside, Sanquhar	Nithsdale Milk Record Society.
Mr William Murray, Burrowmoss, Wigtown	Lower Wigtownshire Milk Record Society.
Mr W. H. Ralston, Estate Office, Dunragit	Rhins of Galloway Milk Record Society.

Name and address.	Representative of
Mr D. Stevenson, Changue, Cumnock	Cumnock and District Milk Record Society.
Sir Hugh Shaw-Stewart, Bart., Ardgowan, Greenock	
	Rowallan Milk Record Society.

*Chairman*—Sir Hugh Shaw-Stewart, Bart.

*Secretary and Treasurer*—Mr John Howie, 58 Alloway Street, Ayr.

Rules and regulations bearing on the committee's scheme for the taking and keeping of milk records in 1908 were at once framed and issued. Eleven local societies, with in all thirteen stations, made applications for the conducting of milk records in terms of the committee's scheme. At eight of the stations the records extended from February or March to October or November, while at the others they practically extended over the whole year, and are intended to go on continuously.

The only fund at the disposal of the committee was a grant of £200 received from the Highland and Agricultural Society. To local societies applying for the first time, and certain other societies, the committee gave a grant of £10 towards conducting and keeping the records, and a further grant of £5 towards supplying testing appliances where such were required. A grant of £7 was given to each of the older societies. In this way the committee spent £141. There thus remained about £59 anent administrative work, the checking and summarising of the milk record books of each society, and the printing of the results. This could not be anything like sufficient for these purposes, and the balance will have to be contributed by the members who have benefited by the work.

Under the care of the committee there has been an enormous increase in the number of cows tested during the past season. The number of milk record societies increased from 7 in 1907 to 13 in 1908, and the number of cows tested from 3931 in 1907 to 8132 in 1908.

New societies as a rule begin too late, and in consequence often lose a considerable part of the value of the first year's work. The tendency with all societies is now to begin earlier than formerly, even in the cheese-making districts, so that as many full lactations may be obtained as possible. While a full lactation is obtained for the inferior and medium milking cows in a limited period of testing, the best of the cows require a much longer period, and even in a cheese-making district these cannot be very fully tested in much under eleven months.

There is also a more general desire than formerly to carry on the work continuously throughout the year in those districts where the milk is otherwise disposed of than made into cheese.

These tendencies are all in the direction of greater efficiency, and it is to be hoped that they will continue.

In the past season one herd which had been in the milk records for fully three years was completely dispersed, and it realised highly satisfactory prices. Another herd which had been tested for two seasons was in part dispersed, and encouraging prices were obtained for all animals with good milk records.

The following is a list of the local milk record societies which were in operation in 1908:—

Name.	Secretary.
Carriack . . . .	John Stevenson, jun., Balig, Ballantrae.
Central Ayrshire . .	James Howie, Hillhouse, Kilmarnock.
Cumnock and district .	A.W. Montgomery, Lessnessock, Ochiltree.
Dunragit and district .	W. H. Ralston, Estate Office, Stranraer.
Fenwick . . . .	James Dunlop, Hall House, Fenwick.
Kirkcudbright and district	John Hayman, Glentarff, Ringford.
Leswalt and Kirkcolm .	John M'Caig, Challoch, Leswalt.
Lesmahagow . . . .	Gavin Hamilton, Banker, Lesmahagow.
Lower Wigtownshire . .	William Murray, Burrowmoss, Wigtown.
Nithsdale . . . .	John Henderson, Lockerbie.
Rowallan . . . .	James Dunlop, Hall House, Fenwick.
Stewartry No. 1 . . .	Patrick Gifford, Solicitor, Castle-Douglas.
„ No. 2 . . . .	

The membership of the societies, number of cows tested, and other details are as follows:—

Name of the Society.	No. of members.	Period over which testing extended in weeks.	No. of cows tested.	Interval between the tests in days.
Carriack . . . .	16	34	662	21
Central Ayrshire . .	18	44	641	21
Cumnock . . . .	18	38	524	21
Dunragit . . . .	8	32	664	14
Fenwick . . . .	18	52	598	21
Kirkcudbright . . .	18	26	777	21
Leswalt and Kirkcolm	15	33	751	21
Lesmahagow . . . .	9	40	212	21
Lower Wigtownshire .	15	33	881	21
Nithsdale . . . .	18	35	562	21
Rowallan . . . .	18	52	542	21
Stewartry No. 1 . . .	11	38	679	21
„ No. 2 . . . .	11	35	637	21
	193		8132	

Several members have two, three, and even four herds being tested. Some of these herds are even so large that the expert has to spend two days on them.

#### CARRICK DISTRICT MILK RECORD SOCIETY.

This society was started early in 1908, principally through the efforts of Mr Stevenson, jun., of Balig, Ballantrae. The farms are mostly situated either in the Maybole district or that of Ballantrae. The distance between the two parishes is considerable, and the double shift once every three weeks means some expense and a good deal of time. Each parish should, however, in time be able to support a society of its own; but until that is accomplished the joint arrangement is the best attainable. The following is a list of the members for whom 662 cows were tested during the season:—

Thomas Arthur, Carlton Mains, Girvan.  
John Bone, Merkland, Kirkmichael.  
Colin Clark, Currah, Girvan.  
Andrew Dougan, Straid, Girvan.  
Quintin Dunlop, jun., Greenan, Ayr.  
Archibald Gray, Kirkland, Kirkoswald.  
William Gray, Shanter, Maidens.  
James Hannah, Enoch, Girvan.  
W. T. R. Houldsworth, Threave, Kirkmichael.  
William Lennox, Altizourie, Maybole.  
James Littlejohn, Genoch, Ayr.  
Mrs Marshall, Little Turnberry, Maidens.  
Mrs Marshall, Park, Kirkoswald.  
William Mitchell, Bennan, Straiton.  
W. D. M'Cubbin, Lochlands, Maybole.  
John Stevenson, jun., Balig, Ballantrae.

Work began on 16th April, continued on till 31st December, and was therefore carried on for only 34 weeks. As it is customary on many of the farms for a large proportion of the cows to calve in autumn, the number of cows with a full lactation is therefore very small, and it was only in a very few instances that the parts of two lactations which were recorded amounted to an equivalent of 900 gallons of milk of 3 per cent of fat. In districts such as this, few full lactations are obtained till the society has run a second year. Although the records obtained up to date are, for the reasons stated, comparatively small, there seem to be in this district a considerable number of very heavy milking cows. The better class of animals are distributed over about one-half of the

farms, there being 17 cows which yielded an equivalent of from 900 to 1000 gallons of milk of 3 per cent of fat; 9 cows which had from 1000 to 1100 gallons; 4 which had from 1100 to 1200 gallons; and 1 which had over 1200 gallons of similar milk. In this district it is very noticeable that the cows referred to get their position in the various classes into which they have been divided as much from the high per cent of fat in their milk as from the large quantity which they gave.

#### CENTRAL AYRSHIRE MILK RECORD SOCIETY.

This society is composed of members whose farms lie principally in the district between Ayr and Kilmarnock. The society is in its first year, and was got up principally through the efforts of Mr James Howie, Hillhouse. A good many of the members had been previously connected either with the Fenwick Society or one of the others, but who now desired to form one in their own immediate neighbourhood. The society was made up of the following members, and for them 641 cows were tested:—

James Borland, Mossbog, Mauchline.  
 James Bowie, Overland, Hurlford.  
 John Drennan, Hillhouse, Galston.  
 John N. Drummond, Bargower, Hurlford.  
 Thomas Drummond, Craighead, Hurlford.  
 David Gray, Barmoorhill, Tarbolton.  
 William Howie, Burnhouses, Kilmarnock.  
 Thomas Howie, Fairfield Mains, Monkton.  
 James Howie, Hillhouse, Kilmarnock.  
 John S. Hunter, Fulton, Monkton.  
 James Kilpatrick, Craigie Byre, Kilmarnock.  
 Thomas C. Lindsay, Aitkenbrae, Monkton.  
 Thomas C. Lindsay, New Dykes, Monkton.  
 James Neil, Barleith, Hurlford.  
 A. M. Stevenson, Janefield, Symington.  
 R. & H. Sillars, Whiteside, Monkton.  
 Miss Stuart, Muirhouse, Symington.  
 Robert Woodburn, jun., Whitehill, Hurlford.

Work was begun in this society on 2nd March, and is expected to go on continuously. The interval of testing was 21 days. This district contains many excellent herds, and among those tested an exceptionally large number have given very high yields, notwithstanding the late date at which testing began in some of the herds. In the interval over which the work extended only two herds had not one or more cows which gave an equivalent of 900 gallons or over of milk of 3 per cent of fat, and out of the

total there were 105 cows which did so. Out of these, 51 yielded between 900 and 1000 gallons, 34 between 1000 and 1100 gallons, 15 between 1100 and 1200 gallons, and on four farms 5 over 1200 gallons of this quality of milk. This is an exceptionally good record, and I have no doubt that next year, when the best cows will have an opportunity of completing their lactations, that the yields recorded will be much larger.

#### CUMNOCK DISTRICT MILK RECORD SOCIETY.

This society owes its existence principally to the interest taken in the work by Mr A. W. Montgonerie, Lessnessock. Some of the members of this society have been associated with the milk records since their commencement. Since the work began there have been considerable changes in the membership of the society, but during the last year or two these have not been any greater than usually occurs with societies of the kind at the end of each year. The following is a list of the members:—

James Bain, Horseclaugh, Cumnock.  
James Donaldson, Auchincross, New Cumnock.  
J. & F. Ferguson, Auchinbay, Ochiltree.  
James Findlay, Duncanziemere, Cumnock.  
John Fleming, Dykes, Cumnock.  
D. & J. Knox, Lane, Drongan.  
John Lennox, Auchingee, New Cumnock.  
Michael Logan, Bargaenoch, Drongan.  
Andrew Logan, Overton, Drongan.  
A. W. Montgomerie, Lessnessock, Ochiltree.  
Hugh M'Queen, Quilkieston, Mauchline.  
J. Millar, Stairhill, Mauchline.  
James Robb, Hindsward, Cumnock.  
John Sloan, Creoch, New Cumnock.  
John P. Smith, Thirdpart, Auchinleck.  
Robert Struthers, Whiteholm, Cumnock.  
Robert Wardrop, Bankend, Cumnock.  
D. & H. Wilson, Auchencloich, Ochiltree.

As in 1907, this society was composed of 18 members. Several farmers in the district desired to join, and to enable them to do so a number of members on the borders of Dumfriesshire arranged to join the Nithsdale Society, these being equally as convenient for the one as for the other. The number of cows tested is much the same as in the previous year, there being 530 in 1907 and 524 in 1908. The interval between the tests was 21 days. The milk of the cows in this

district is principally devoted to cheese-making, and as the whole locality is at a high altitude, the cows as a rule seldom begin to calve very early. Testing began 2nd March and continued for 38 weeks, the period over which the testing extended in 1906 and 1907 being 38 weeks. Testing was stopped last season on 26th November, by which date a large proportion of the cows were dry or giving very little milk.

In 1906 there were 16 cows belonging to members of this society which yielded 1000 gallons of milk of an equivalent of 3 per cent of fat or over. In 1907 there were 22 cows which gave this amount of milk, a large proportion of which were on two farms. One of these herds has been transferred to the Nithsdale Society, and the other has parted with many of its oldest cows, most of which were heavy milkers. This last herd, therefore, has a much smaller number giving 1000 gallons of milk than in 1907, but it still heads the list by 8 out of a total of 16 cows giving this quantity. In 1907 these cows were in seven herds, but in 1908, with a smaller number, they are distributed over eight herds. The gain for the year is not great, but it indicates a movement in the right direction.

#### FENWICK MILK RECORD SOCIETY.

This society started at the beginning of January 1905 with 18 members, and a test at intervals of 21 days. Since then it has carried on this work without a break, and with very little change in its membership. There are one or two herds which, under the auspices of various societies, have been tested for a greater number of years than any in this parish, but at the present time this society has run continuously for a greater number of years, with less change in its membership, than any other. The success of the society is in great part due to the efforts of the secretary, Mr Dunlop, late of Midland, who from the beginning has been very enthusiastic in this work. During the past year there were tested 565 cows belonging to the following members:—

J. & R. Barr, Southcraig, Kilmarnock.  
Andrew Calderwood, Collarie, Fenwick.  
Thomas Clement, Netherton, Newton Mearns.  
James Dunlop, Gree, Fenwick.  
James Dunlop, Midland, Fenwick.<sup>1</sup>  
John Douglas, Langdyke, Fenwick.  
James Garven, Dalmusternock, Fenwick.  
John Gemmell, Aitkenhead, Fenwick.  
John Lindsay, High Blackbyre, Fenwick.

<sup>1</sup> Till May only, the stock being then sold.

John Lindsay, Moss-side, Fenwick.

Robert Loudon, Harelaw, Fenwick.

Mrs Mather, Thorn, Fenwick.

David Murchland, Broadmoss, Fenwick.

Sir John Stirling-Maxwell, Bart., Byres Farm, Pollokshaws.

Sir Hugh Shaw-Stewart, Bart. of Ardgowan, Inverkip.

William Wilson, High Todhill, Fenwick.

James Wyllie, North Glasscock, Fenwick.

James Young, Hareshaw, Fenwick.

James Young, Wardlaw, Kilmarnock.

The other societies, which have not run for a whole year, cannot be fairly compared with this one, where the full lactation of each animal is sooner or later obtained. Out of those tested there were 188 which gave an equivalent of 900 gallons of milk or over of 3 per cent of fat. On every farm except two there was one or more of these cows, and the exceptions were farms on which the testing had only extended over 30 odd weeks, as they replaced herds which were transferred to another society.

There are 44 animals on 15 farms which have yielded between 1000 and 1100 gallons; 22 on 9 farms which have yielded between 1100 and 1200 gallons; 23 on 11 farms between 1200 and 1300 gallons; 10 on 4 farms between 1300 and 1400 gallons; 7 on 4 farms between 1400 and 1500 gallons; and 1 which gave over 1500 gallons of an equivalent of 3 per cent of fat. Most of these cows had calves within the year, or were due to calve in a little over the year; but there were, in addition to these, 9 cows on 7 farms which gave exceptional quantities, ranging from 1400 to 1600 gallons of an equivalent of 3 per cent of fat, but which were an abnormally long period in milk, and which in consequence are not comparable with other cows producing a calf in about the year.

Comparing the yields of the best cows in this society with those of the best cows in 1907, we find that out of a somewhat similar number of cows there are 116 which have yielded over 1000 gallons of milk of an equivalent of 3 per cent of fat, whereas the number was 110 for 1907, and 81 for 1906. In 1908 there were 50 cows which yielded an equivalent or over 1200 gallons of milk of 3 per cent of fat, while in 1907 it was 45, and in 1906 there were only 12 such cows known. They were considered wonderful at that time, but already there are 50 such cows among a dozen of the members. That is very gratifying progress, yet that is not all, for the number of animals of exceptionally high yield is this year also higher than in 1907.

In 1906 there were 13 heifers which yielded 900 gallons or over of an equivalent of 3 per cent of fat, while in 1907

there were 22, and in 1908 this was increased to 24, several of which had exceptionally good yields. These heifers are only from a portion of the herds, as the three new members who joined to replace those transferred to another society have been unable to get a full record of the lactations of almost any of their stock. Previous to this the advance made has been attained mainly by elimination of the poor milking cows, but now the results from breeding from animals of superior milking ability should gradually begin to show itself.

Since the last report was published a record has been made up for each year of all the cows in this society which had completed lactations, in order that a basis might be established for estimating the progress that may be made in future years. The following table gives the figures as far as they have been completed:—

AVERAGE YIELD OF MILK AND PER CENT OF BUTTER-FAT OF ALL COWS WHICH HAVE COMPLETED THEIR LACTATIONS EACH YEAR SINCE 1905.

Year.	Number of cows.	Milk in gallons.	Per cent of fat.	Milk of 3 per cent of fat in gallons.
1905	392	695.5	3.670	850.8
1906	412	692.6	3.680	849.6
1907	277	709.1	3.845	908.8
Increase over first year		13.6	.175	58.0

#### LESMAHAGOW MILK RECORD SOCIETY.

This society was inaugurated two years ago, principally through the efforts of Mr Charles Douglas of Auchlochan. The farms in the district are generally small, and in consequence the expenses of work of this kind are heavier per cow than where the herds are larger. Mr Douglas agreed with the other members that if they paid a certain sum per head, he would be responsible for all the expenses. The matter of expense is always a crucial difficulty in the formation of a new society, especially if the herds are small, and where there is a local gentleman sufficiently interested in the work to take this risk, it helps materially in getting the new society fairly on its legs. For the following members 212 cows were tested during the year:—

William Chalmers, Woodhead, Lesmahagow.  
 Mr Charles Douglas, Auchlochan, Lesmahagow.  
 Mr Charles Douglas, Hillside, Lesmahagow.  
 Alex. Gillies, Brackenridge, Lesmahagow.

John M'Gregor, Boghill, Lesmahagow.  
Mrs M'Gregor, Lesserlinn, Kirkfieldbank.  
Robert M'Kinlay, Hillhouse, Sandilands.  
George Sandilands, Middleholm, Lesmahagow.  
John Steel, Waterhead, Lesmahagow.

Testing began early in April and continued to the end of the year. No testing was done during mid-winter, and a few of the cows have their record based on what the yield was at the beginning and end of this interval of 96 days. On that account the record for the few cows to which that remark applies is unlikely to be so accurate as those taken at 14-day intervals. A considerable quantity of winter milk was produced in one herd, whereas the majority of the others were composed of spring-calving cows, and on that account it was considered inadvisable to continue the work throughout the dead of winter. In future the work is likely to go on continuously.

Although the number of cows tested is small compared with some of the societies farther south, the number of cows giving large yields is very great. For the members of the society there were 27 cows tested, which yielded an equivalent of upwards of 900 gallons of milk of 3 per cent of fat. Of these, 12 on four farms had between 900 and 1000 gallons; 8 on four farms between 1000 and 1100 gallons; 4 on four farms between 1100 and 1200 gallons of similar milk within the year. In several of these cases the quantity credited to each cow was part of two lactations. At the time when the books closed, one heifer which had calved at the end of March was still giving a considerable quantity of milk, and had yielded at that date 878·4 gallons of an average of 3·95 per cent of fat.

#### LESWALT AND KIRKCOLM MILK RECORD SOCIETY.

This society was established through the exertions of Mr John M'Caig, Challoch. Although spread over two parishes, it is a good example of what such societies should be; but instead of being spread over two or more parishes, as some of them are, there should be two or more societies in every parish, and it is to be hoped that such a state of matters will be brought about after a time. The following is the list of members:—

John Agnew, Balwhirrie, Stranraer.  
Andrew Cochrane, High Ardwell, Kirkcolm.  
George Cochrane, North Cairn, Kirkcolm.  
Robert Cochrane, Portencallie, Kirkcolm.  
Stephen Hunter, Whiteleys, Stranraer.

John M'Caig, Challoch, Leswalt.  
John M'Caig, Kirkland, Leswalt.  
John M'Camon, Barnhills, Kirkcolm.  
Alexander M'Camon, Kirranrae, Kirkcolm.  
John M'Harg, Merslaugh, Stranraer.  
Robert Purdie, High Craichmore, Stranraer.  
James Robertson, Low Craichmore, Stranraer.  
Robert Ross, Cairnside, Kirkcolm.  
James Sproat, Barbeth, Stranraer.  
Mrs Sproat, Dhuloch Mains, Leswalt.

As will be noticed, this society contains 15 members, which, under ordinary circumstances, means that the test would be made at intervals of 17 days if no work were done on Sundays. As a rule the membership is limited to such a number as will permit of the expert in charge making a circuit of the farms in two or three weeks. There is, however, no absolute necessity for this, as any number of members will suit equally as well as 12 or 18, the only difference being that where the number does not correspond with a circuit of two or three weeks, the expert cannot pass the Sundays always at the same place, but does so at each farm in rotation. In this instance, however, there was no necessity for this, as three of the herds were sufficiently large to employ the expert for two days each, so that there were 18 days' work among the 15 members, thus making each test at intervals of 21 days. Work began on 8th March and ceased on 29th October, the period covered being 33 weeks.

The season does not seem to have been a particularly good one for the district, and the yield of several of the herds is believed to have been below their usual average, while one or two of them are exceptionally low. Notwithstanding these drawbacks, 3 cows in one herd and 2 in another, both from herds of average size, yielded over 1000 gallons of milk of an equivalent of 3 per cent of fat. There are 12 cows which yielded over 900 gallons but less than 1000 gallons of milk of an equivalent of 3 per cent of fat in the period under review. These cows are distributed over five farms, but 7 of them are in one of the moderately-sized herds. The total number of cows tested for the members was 651.

#### KIRKCUDBRIGHT AND DISTRICT MILK RECORD SOCIETY.

This society began in the spring of 1907, and as the most of the milk in the district is devoted to the manufacture of cheese, the majority of the cows calve in spring. It was found desirable in the spring of 1908 to make some little change in the member-

ship; a second society was formed in the Castle-Douglas district, and some members belonging to each society could be more conveniently served by being transferred to the other. This was done with mutual advantage to all concerned. The following is a list of the members of this society for whom records were kept:—

Robert Armstrong, Littleton, Gatehouse.  
Alexander Barr, Valleyfield, Ringford.  
Mrs Brown, Balannan, Ringford.  
George Bryson, Boreland, Parton.  
George Corrie, Park, Tongland.  
John Douglas, Barstibly, Castle-Douglas.  
W. P. Gilmour, Balmangan, Borgue.  
W. P. Gilmour, Chapelton, Borgue.  
Edward Gordon, Dunjop, Castle-Douglas.  
Matthew Hastings, Barstobrick, Ringford.  
John Hendry, Chapel, Ringford.  
Robert Maltman, Fellend, Ringford.  
William Nicholson, Bombie, Kirkecudbright.  
James Robertson, Redfield, Twynholm.  
James Smith, Twynholm Mains, Twynholm.  
Thomas Stewart, Lochhill, Ringford.  
William Stroyan, Trostrie, Twynholm.

Work was begun on the 29th February and was continued till 17th October, the period embraced extending over 33 weeks only. The period might with advantage have been extended somewhat, as it is too short to afford even good milking cows an opportunity of yielding sufficient milk to meet the regulation for entry in the Ayrshire Herd-Book. In future this should be kept in view. The testing was done at intervals of 21 days; yet notwithstanding the shortness of the period over which it extended, several very good records have been made of individual cows. Several herds have a particularly good average, although they have no cows with a record of 900 gallons of milk with an equivalent of 3 per cent of fat or over.

For the members of the society a record has been kept of the yield of 777 cows. Among these there was one cow which in this short period yielded over 1100 gallons of milk of an equivalent of 3 per cent of fat, and another which had over 1000, and ten which had over 900 gallons of similar milk. The latter were spread over five farms; but three of them, and one of the cows giving 1000 gallons, and the one giving over 1100 gallons, were in one herd. Another herd had four of the ten giving 900 gallons of an equivalent of 3 per cent of fat.

## NITHSDALE MILK RECORD SOCIETY.

The farmers of Dumfriesshire had a milk record society in the first year of the work. They dropped the work the second year, took it up the fourth year, dropped it the fifth season, began it for the third time last year, and are expected to go on regularly now. The members who are enthusiastic in the work have joined every year, but others who were lukewarm regarding it usually dropped off after the first year and had to be replaced by others. This caused far more changes in the membership than is good for any society, but it seems now to have settled down to a number who are likely to carry on the work continuously. Several members of the Cumnock Society, who were equally as closely associated with Nithsdale as Cumnock, were transferred to the former society in order to make room for new members in the Cumnock Society. The following is a list of the members in 1908:—

Hugh H. Allan, Buchan, Thornhill.  
Andrew M. Baird, Garclaugh, New Cumnock.  
Robert Brown, Croftjane, Thornhill.  
Thomas Brown, Drum, Thornhill.  
David A. Dickie, Tower, Sanquhar.  
John Harper, Bennan, Thornhill.  
James Laidlaw, Glengar, Thornhill.  
James Lamberton, Kirkcudbright, Moniaive.  
Sir Emilius Lawrie, Bart., Straith, Moniaive.  
Robert Millar, Lakehead, Closeburn.  
James Moffat, Gateside, Sanquhar.  
W. & M. Sloan, Castlemains, New Cumnock.  
William Sloan, Shawsmuir, Thornhill.  
Allan Stevenson, Muirhill, Thornhill.  
Allan Stevenson, Nether Cairn, New Cumnock.  
James H. Stevenson, Rottenyard, New Cumnock.  
James Wallace, Auchenbainzie, Thornhill.  
Robert Weir, Townfoot, Thornhill.

Work began on 23rd March and continued till 23rd November, extending thus over 35 weeks. A record was made of each herd every 21 days. There were tested for the members 562 cows, among which there are a large number of very good cows, uniformly spread over a large proportion of the herds. In the comparatively short period over which the testing extended there was 1 cow which yielded over 1100 gallons of milk of an equivalent of 3 per cent of fat; 6 cows on four farms with over 1000 gallons; and 22 cows on nine farms with over 900 gallons of the same quality of milk. Two of the herds contain almost the half of these superior cows, and if

the period over which the testing extended had embraced the whole lactation of these animals, they would very likely have had an exceptionally large record.

#### RHINS OF GALLOWAY MILK RECORD SOCIETY.

This society, which is a very good example of a parish or district one, was instituted principally through the efforts of Mr W. H. Ralston, factor on the Dunragit estate, who from the very start of the milk record movement in Scotland has taken a keen interest in this work. Progress in most of the districts has generally been the result of the efforts of some one who is fully aware of the value of the work and prepared to take the initiative in getting up a society. In most districts there are a sufficient number of farmers aware of its value to warrant the starting of a new society, but in many cases the work is delayed for years, simply because no one is prepared to take the lead. This society had the following membership:—

J. C. Cuninghame, Dunragit Home Farm, Dunragit.  
J. C. Cuninghame, East Borland, Dunragit.  
R. Hughes, Back of the Wall, Glenluce.  
David M'Dowall, Glenhowl, Glenluce.  
William M'Master, Boreland, Dunragit.  
William M'Master, East Challoch, Dunragit.  
John Murray, Kilfillan, Glenluce.  
John Stevenson, Balcarry, Glenluce.  
Robert Stevenson, Drumflower, Dunragit.  
United Creameries Co., Ltd., West Challoch, Dunragit.

While there were only ten herds among the eight members who constituted the society, two of these were so large that sufficient work was provided to take up the full time of the expert, the record being made at intervals of 14 days. Work began on 3rd March and continued till 17th October, the interval covered being one of 31 weeks. The milk of the herds is all devoted to cheese-making, which is either manufactured at the local creamery or at the farms. The period covered is quite sufficient to indicate the superior or inferior cows in each herd, and from that point of view, which is really the main one for such societies as this, it has served quite a useful purpose. Such a short period does not, however, give an opportunity of estimating the full capabilities of the best cows, or of comparing them with other good cows in a different district; nor does it afford the farmers of the district much opportunity of benefiting by the expenditure of the public money which is contributed to these societies by the Highland and Agricultural Society for this express purpose. It is there-

fore to be hoped that the members will see the desirability of continuing the work over a longer period in future.

There were tested for the members 628 cows, and among these 1 cow yielded over 1000 gallons of milk of an equivalent of 3 per cent of fat; 7 cows, six of which were in one herd, over 900 gallons of similar milk; and 17 cows, eleven of which were in one herd, over 800 gallons of milk of an equivalent of 3 per cent of fat. The average yield and per cent of fat for each herd are as follows:—

A = { 44 cows which yielded an average of }		407·7 { gallons of milk of an average of }		3·43 % of fat	
B =	52	"	395·0	"	3·42 "
C =	49	"	495·7	"	3·47 "
D =	71	"	505·0	"	3·52 "
E =	78	"	605·0	"	3·57 "
F =	53	"	432·0	"	3·21 "
G =	104	"	480·8	"	3·66 "
H =	50	"	455·7	"	3·49 "
I =	103	"	460·8	"	3·38 "
J =	62	"	349·7	"	3·34 "
<hr/> 664		"	442·5	"	3·45

#### ROWALLAN MILK RECORD SOCIETY.

This is a second society which was started in the parish of Fenwick in the spring of 1907. Comparatively speaking, the herds are small; on the average they are probably the smallest of any of the milk record societies. The two societies in this parish are typical of what might and should exist in every parish where milk stock are bred. Some of the societies have their members scattered over two or three parishes, but here among the smallest class of farmers there have been two societies in the one parish for two years. The membership of the society was as follows:—

Robert Alexander, Artnoch, Fenwick.  
 John Brown, Hillhousehill, Fenwick.  
 Mrs Calderwood, High Gainford, Fenwick.  
 James Calderwood, Windyhill, Fenwick.  
 Robert Cunningham, Arness, Fenwick.  
 Robert Dickie, West Tannacrieff, Fenwick.  
 Mrs Dunlop, Old Hall, Fenwick.  
 William Dunlop, Warnockland, Fenwick.  
 John Jack, Tannacrieff, Fenwick.  
 John B. Logan, Gainhill, Fenwick.  
 Andrew Mair, Poriskin, Fenwick.  
 Thomas M'Dougall, Laighmuir, Fenwick.  
 William Morton, Meiklewood, Fenwick.

William Murdoch, Buntonhill, Fenwick.  
 George Retson, Gardium, Fenwick.  
 David Sillars, Low Todhill, Fenwick.  
 John Smith, Wyllieland, Fenwick.  
 John P. Young, Parkhead, Fenwick.

The cows are tested at intervals of 21 days, and during the year there have been tested for the members 542 cows. Every member of this society has one or more animals which have yielded an equivalent of 900 gallons or over of milk of 3 per cent of fat, and the same cannot be said of any other society yet started. Among the members there were 181 cows giving that quantity or more, of which 66 gave over 900 and less than 1000; 44 over 1000 and less than 1100; 35 between 1100 and 1200; 17 between 1200 and 1300; 5 between 1300 and 1400; 3 between 1400 and 1500; 2 over 1500 gallons, but one of these was over an average time in milk; one over 1700; another over 1900; and one over 2000,—all, however, an exceptional time in milk, and therefore not comparable with cows having a calf each year.

One cow gave 1300 gallons of 3·5 per cent fat in 47½ weeks. In another herd there were 4 cows which yielded the following,—1253½ gallons of 3·3 per cent fat in 44 weeks; 1178½ gallons of 3·4 per cent fat in 46½ weeks; 1089½ gallons of 3·7 per cent fat in 57 weeks; and 1139 gallons of 3·7 per cent fat in 58½ weeks. These are exceptional yields, and do great credit to the owners and the district, and I have no doubt that better records will yet be produced.

#### STEWARTRY DAIRY ASSOCIATION.

This association has two milk record sections—one in the neighbourhood of Castle-Douglas, and the other around Dalbeattie. The following is a list of the members of the Castle-Douglas section, who had among them 679 cows which were tested :—

J. Boyd, Castlegower, Castle-Douglas.  
 H. W. B. Crawford, Auchenfad, Auchencairn.  
 H. W. B. Crawford, Caigton, Castle-Douglas.  
 H. W. B. Crawford, Hall, Auchencairn.  
 Thomas Douglas, Lochdougan, Castle-Douglas.  
 J. R. Millar, Midkelton, Castle-Douglas.  
 James M'Adam, Craigley, Castle-Douglas.  
 John B. Stevenson, Chapelcroft, Castle-Douglas.  
 J. Smith, Meikle-Knox, Castle-Douglas.  
 D. Symington, Kirkcarswell, Kirkcudbright.  
 James Wallace, Chapelhill, Kirkcudbright.

The interval between the visits of the expert was 21 days, for although there were only 11 members, fully half of the herds were too large to be undertaken by one man in one day. Two days were therefore spent at all the larger herds. Testing began on February 14 and continued till November 26, thus extending over a period of 38 weeks.

This district is almost entirely a cheese-making one, and although the period over which the testing extended was quite sufficient to indicate the value as milkers of the most of the cows in each herd, it was several weeks too short to take in the whole lactation of any but the poorest milkers or heifers in each herd. This will be more or less remedied in the future. For the current year work was begun two weeks earlier than in 1908, and this will make a very considerable difference not only in the total results but in their accuracy.

In the section one member had a cow which seems not to have settled to the bull, which calved on June 30, 1907, and milked on till October 8, 1908; in the 16 months this cow gave a milk yield which was estimated at 1294 gallons, of an average of 3·8 per cent of fat. Her milk was not periodically weighed between October 5, 1907, and January 29, 1908, but taking the mean of what she gave on these two dates, and estimating it as the average of the intervening period, the yield would be as stated. The period is not a normal one, but all the same the yield seems to indicate a good cow.

In one other herd there were 3 cows each of which had over 1100 gallons of milk of an equivalent of 3 per cent of fat; and out of 11 cows which yielded over 1000 gallons of a similar quality 9 were in one herd. Other two herds had one cow each which yielded this quantity. Among the 11 herds constituting the section, 6 of them contained one or more cows which yielded 900 gallons or over of milk of an equivalent of 3 per cent of fat. There were altogether 21 cows which had a yield of over 900 and were under 1000 gallons of milk of an equivalent of 3 per cent fat, and of these there were 12 cows in one herd.

#### STEWARTRY DAIRY ASSOCIATION—DALBEATTIE MILK RECORD SECTION.

The following is a list of the members of this section, who had 637 cows tested for them during the season:—

Richard Barbour, Isles, Dalbeattie.

James Bickett, Gerranton, Castle-Douglas.

Mrs Clark, Dryburgh, Castle-Douglas.

Captain Cochran, Torrorie, Preston Mill, Dumfries.

H. W. B. Crawford, Chapmanton, Castle-Douglas.

David M'Gill, Hillowton, Castle-Douglas.  
J. G. M'Myn, Kirkhouse, Kirkbean, Dumfries.  
Sir Mark J. M'Taggart Stewart, Bart., Southwick.  
Thomas Sloan, Newmains, Preston Mill, Dumfries.  
John Taylor, Edingham, Dalbeattie.  
Hugh Hastings, Whitecroft, Southwick.

In this section testing began on March 7 and continued till November 26. It therefore extended over 35 weeks. While the herds were not so large as the largest ones in the Castle-Douglas section, still the majority of them could not be undertaken by one man in one day. Although, therefore, there were only 10 members, there was sufficient work for the man to go round their herds every 21 days. On the last circuit, when many of the cows were dry, the round was completed in 14 days, and if a beginning were made early enough it is very likely that one or two circuits might then be completed in 14 days, although it took 21 days to do them after the bulk of the cows had calved.

A general improvement is very noticeable over all the herds belonging to members of this section compared with the previous or former year. For instance, there are only two herds which have not had one or more cows which have given 900 gallons of milk of an equivalent of 3 per cent of fat. In 1907 there was only one section for the Castle-Douglas and Dalbeattie district, while in 1908 there were two. In 1907 there were 23 cows out of a total of 969 which gave an equivalent of 1000 gallons of milk of 3 per cent of fat, which is equal to 2·37 per cent of those tested.

In 1908 there were 27 cows out of 576 which gave that quantity of milk, which is equal to 4·7 per cent of the total number, so that practically speaking the good cows have been doubled.

From a cursory glance at the quantities yielded, it also appears that the average yield has been much increased, but as there is no time available for working out the average for each herd as was done for 1907, that point cannot be definitely settled at present. Among the cows tested for the members, there are 55 which gave an equivalent of 900 gallons or over of milk at 3 per cent fat; 24 which have yielded between 1000 and 1100 gallons of similar milk; 2 between 1100 and 1200 gallons; and 1 over 1200 gallons.

#### LOWER DISTRICT OF WIGTOWNSHIRE MILK RECORD SOCIETY.

This society began in 1907 with 12 members, who made a record of the yield of their cows every 14 days; but in 1908 others desired to join, and the membership was raised to

15, which necessitated testing at 21-day intervals. During the season there were tested for the members 881 cows. The following is a list of the members of the society :—

Archibald B. Crawford, Broughton Mains, Sorbie.  
 J. W. Findlay, Bailliewhirr, Whithorn.  
 Messrs Kerr, Main of Machrimore, Newton-Stewart.  
 J. W. & R. Lindsay, Carsegown, Wigtown.  
 Mrs Lochrie, West Kirkland, Wigtown.  
 William Logan, Whitehills, Sorbie.  
 John Morton, Auldbreck, Whithorn.  
 William Murray, Burrowmoss, Wigtown.  
 William McCaig, Low Balgray, Whithorn.  
 Dr George M'Gill, Challoch, Newton-Stewart.  
 George M'Ilwraith, Stannock, Isle of Whithorn.  
 J. & A. Owen, Kevans, Whithorn.  
 James Wallace, Craiglemine, Whithorn.  
 David S. Young, Balcraig, Port William.  
 David Young, Druchtag, Port William.

Although there were only 15 members in the society, the number of cows is very large, as the most of the herds numbered about 50, while three of them ran from 95 to 102 cows each. These three herds necessitated the expert devoting two days to each, which made up his number of working days to 18. Work began on March 14 and stopped on November 22, so that the period over which the records extend is 33 weeks. This is considerably longer than in 1907, when this society had the shortest period of all those then working. It is not, however, as long as might be desired, although quite sufficient to indicate the profitable from the unprofitable cows.

Notwithstanding the short period over which the testing extended, 30 cows yielded between 900 and 1000 gallons of milk of an equivalent of 3 per cent of fat; 7 between 1000 and 1100 gallons; 1 between 1100 and 1200 gallons; and 1 gave an equivalent of 1265 gallons of 3 per cent of fat. There are six herds not represented in any of these classes, but in other respects the better animals are more uniformly distributed among the herds than occurs in most of the societies.

In districts such as the south of Scotland, where a large proportion of the cows are let on what is known as the "bowing" system, the introduction of milk records is likely to exercise a most important influence on the sum paid per cow. The records not only form a valuable basis for negotiating how much should be paid per cow, but they afford both owner and dairyman very valuable information regarding the cows which should or should not be excluded from the herd. When both parties come to realise the use that the milk records may

be to them in arranging the most important transactions of their business, many who now look somewhat askance at them will give them much more favourable consideration.

### YIELD OF MILK AND PERCENTAGE OF FAT BY COWS OF DIFFERENT AGES.

Up to the present no reliable information exists regarding the quantity of milk yielded by Ayrshire or other cows of different ages, or what is the average per cent of fat in their milk. Since the last report was issued I have, for all the milk record societies up to the end of 1907, calculated the yield and per cent of fat of all normal cows which have completed their lactations, and produced a calf within the ordinary time in the succeeding year. Among producers of milk there is great difference of opinion regarding the milk yielded by cows at different ages, and more particularly regarding its per cent of fat. The number of cows on which the averages in the following table are based is too limited for many of the ages to be looked on as authentic, but between three years and ten years old the numbers are so great that the figures are almost certain to be at least fairly reliable. In a year or two a sufficient number of animals will be available to admit of a table being constructed which should give a quite reliable average of both quantity and quality.

AVERAGE YIELD OF MILK AND PER CENT OF FAT OF ALL COWS, ACCORDING TO AGE, WHICH HAVE COMPLETED THEIR LACTATIONS IN THE AYRSHIRE CATTLE MILK RECORD SOCIETIES, UP TO THE END OF THE YEAR 1907.

Age of the cow.	Number on which the average is based.	Average milk in gallons.	Average per cent of fat.	Milk of 8 % of fat in gallons.
2	22	450·6	3·88	582·8
2½	38	495·5	3·89	642·5
3	320	565·8	3·87	730·0
4	189	656·4	3·74	818·3
5	152	721·3	3·65	877·6
6	159	738·7	3·67	903·7
7	127	750·5	3·63	908·1
8	87	774·5	3·64	939·7
9	58	771·1	3·69	948·8
10	46	804·8	3·56	955·0
11	26	819·6	3·62	989·0
12	23	740·0	3·67	905·3
13	9	869·1	3·46	1002·3
15	5	784·4	3·69	964·8
16	3	616·6	3·53	725·5
20	1	878·0	3·70	1073·0
Total .	1265			

The age stated is in years, and is that at or near which the cow calved. The most of the cows on which the above estimate is based are in one district and in one milk record society, and it may happen that as the area is widened the averages may be above or below those given.

The heifers 2, 2½, and 3 years old are from three milk record societies. A few of the heifers had scarcely ceased giving milk when the work closed for the year, but their number is so small, and the extra milk they would have yielded would be so little, that its inclusion or exclusion would not materially have altered the averages.

### SUMMARY.

The most gratifying feature of the work of 1908 was undoubtedly the great increase in the number of cows tested. Scarcely any local agricultural society would have cared, even if they had had the inclination, to meet the trouble and expense involved in getting up a new organisation such as this and had the work not been taken in hand by the Highland and Agricultural Society nothing would, in all probability, have been done yet. From its position that Society could withstand adverse criticism and the attacks of interested individuals, and with its resources it could meet with equanimity expenses which would have been a serious undertaking for any ordinary local society.

Another gratifying feature of the work of the past year has been the greater favour which is now bestowed on this work by many who, if not originally actively hostile, were, to say the least of it, not favourably disposed towards it. All over the south-west numerous farmers who were for a time lukewarm have joined in the work, and it says a good deal for their sound common-sense that they have done so.

Before 1908 there were only two societies that continued the work throughout the winter, but during the year just closed there were five societies constantly at work, and they are likely to continue so. These societies are all in districts where winter milk is largely produced, and it seems as if the introduction of milk record societies into some districts would be the means of inducing the farmers of these localities to again enter the list of breeders.

In many of the districts producing milk in winter few, if any, young stock are reared, farmers being under the impression that they can buy cows cheaper than they can rear them, or that their land is too valuable for rearing young stock. These are greatly mistaken impressions. Farmers could probably buy full-grown cattle at less than they could rear their own, but then they are only getting a class of stock which are the outcasts

of the stock of other breeders, and which as milk producers could certainly not be said to be up to the average. If they selected their stock from a milk record point of view, and bred from their best, in a very few years they would likely find themselves in possession of herds yielding from 10 to 30 per cent more milk than they had previously been accustomed to. No ordinary farming land is so valuable that it cannot be profitably utilised in the rearing of such stock, for, leaving the breeding value of such animals out of account, they are worth very much more than common stock simply as milk-producing machines. A cow yielding 600 gallons at a lactation is said to leave 100 gallons of that milk available as profit after paying for food and all expenses; a cow giving 700 gallons could be kept on almost the same food, and from her the profit would be the double. If this is so—and we have reason to believe that it is—with cows which yield 600 to 700 gallons, it is not difficult to realise what profits might be reached if cows could be bred to yield 800, 1000, or 1200 gallons.

Since the Ayrshire Milk Records Committee took over this work, a new interest has been added to it, which is almost certain to stimulate enthusiasm not only among those conducting milk records at present, but also among all who breed or use cows. The work has cost the Highland and Agricultural Society a substantial sum of money, but it has been judiciously utilised, and it is questionable if any similar expenditure by the Society has been more highly appreciated by those receiving it, or has done a greater amount of good.

## CATTLE-FEEDING EXPERIMENTS IN BRITAIN.

### A REVIEW OF

OVER 200 TRIALS MADE IN THE YEARS 1833-1908.

By HERBERT INGLE, B.Sc., F.R.S.S.A., F.I.C., F.C.S.

LARGE numbers of experiments on the feeding of cattle have been made in this country during the past fifty or sixty years. The lines on which the trials have been conducted have varied greatly; generally the object in view has been a comparison of the effects of certain food-stuffs. Sometimes equal weights of the contrasted foods have been used, in other cases equal money values have been supplied, while only in the more recent in-

vestigations has much attention been paid to the actual chemical composition of the rations.

In the présent paper an attempt has been made to reduce the results to a uniform basis as far as possible, and it is hoped that in this form they may prove of service to cattle-feeders.

It was thought that the important points to bring out were—

1. The average daily ration.
2. The rate of increase in live-weight.
3. The quantity of digestible matter in the ration.
4. Its albuminoid ratio.
5. The amount of digestible matter consumed per 1 lb. of increase in live-weight.

To give any deductions as to the cost of the various methods of feeding was felt to be of little use, since prices of commodities are liable to such great fluctuations, and even vary greatly with locality.

The array of figures in the table (p. 218) is the result of considerable labour, for in many of the original papers the data are given in a very involved manner. The various columns in the table give—

- I. The name of the experimenter.
- II. The date of the trial.
- III. The publication in which the results appeared.<sup>1</sup>
- IV. The number of animals in each lot, together with age, sex, and breed when known.

<sup>1</sup> The following is a list of the publications containing the official reports on the experiments reviewed, the names of the various publications being indicated in the third column of the table (p. 218) by letters A, B, &c. :—

- A. Transactions of the Highland and Agricultural Society of Scotland.
- B. Journal of the Royal Agricultural Society of England.
- C. Journal of the Board of Agriculture and Fisheries.
- D. Reports of the University College of North Wales, Bangor.
- E. Reports of the West of Scotland Agricultural College.
- F. Reports of the Aberdeen and North of Scotland College of Agriculture.
- G. Reports of the Durham College of Science issued in connection with the County Council of Northumberland.
- H. Reports of the Agricultural Department of Cambridge University.
- I. Reports of the Agricultural Department of Leeds University.
- J. Reports of the Agricultural Department of the University of Wales, Aberystwyth.
- K. Reports of the Edinburgh and East of Scotland College of Agriculture.
- L. Guide to Experiments by the Agricultural Department of Cambridge University.

- V. The duration of the experiment in days.
- VI. The average total gain in live-weight per head, in pounds.
- VII. The average daily gain in live-weight per head, in pounds.
- VIII. The average daily ration.
- IX. The total digestible albuminoids present in the daily ration.
- X. The starch equivalent of the digestible fat, carbohydrates, amides, and fibre in the daily ration.
- XI. The total digestible matter in the daily ration per 1000 lb. live-weight.
- XII. The total digestible albuminoids received per day, per 1000 lb. live-weight.
- XIII. The starch equivalent of the digestible fat, carbohydrates, amides, and fibre received per day per 1000 lb. live-weight.
- XIV. The albuminoid ratio of the ration.
- XV. The weight, in pounds, of digestible matter consumed per 1 lb. increase in live-weight, followed by the sum of the digestible albuminoids and starch equivalent of the fat, amides, carbohydrates, and fibre in that matter, the last in figures enclosed in brackets.
- XVI. The average live-weight of the animals per head during the experiment.

A few words of explanation as to how the figures have been arrived at may be given.

#### *Average Daily Ration per head.*

In a great many cases the feeding has been modified during the experiment, sometimes by a change in the quantities of the original constituents, sometimes by the addition of new food-stuffs. In the table, the figures given are intended to represent the *average* daily ration during the whole experiment, and to be such that, if multiplied by the number of days, they would give the total food consumed by each animal during the whole period. In some few cases the coarse fodder used has not been weighed, and an assumption as to its quantity has had to be made.

Following the detailed average daily ration are the figures giving the total digestible albuminoids or proteins present in it, and the carbohydrate equivalent of the "soluble carbohydrates," fat, fibre, and amides (digestible constituents only being included), calculated as described in the next section. These figures differ from those in the next column only by not

being reduced to the uniform live-weight of 1000 lb., and represent the actual average daily supply to each animal during the experiment.

*Digestible Matter consumed per day, per 1000 lb. live-weight.*

This has been calculated from the quantities of food-stuffs used, by taking the average proportions of digestible matter present, as given in Warington's 'Chemistry of the Farm,' in which distinction is made between albuminoids and amides. When analyses of the food-stuffs are given in the paper abstracted, the figures have been used and a digestion co-efficient assumed for each constituent. The digestion co-efficients have been those given in the various publications of the American Department of Agriculture, compiled chiefly from German and American experiments, and as quoted in Henry's 'Feeds and Feeding,' the writer's 'Manual of Agricultural Chemistry,' and in other works. An exception, however, has been made in the case of roots, for in few of the analyses given has any distinction been made between true albuminoids and "total nitrogenous constituents"; it has therefore been thought fairer to adhere to Warington's figures for the digestible constituents of roots throughout.<sup>1</sup>

It is realised that, in view of the great variability in composition of roots, this plan is not satisfactory, but it is difficult to devise any better method.

In the case of somewhat rare foods being used (Lot 35, barley bran; Lot 161, earth-nut cake; Lot 162, sesame cake; Lot 163, niger cake), digestion co-efficients have had to be assumed without authority, those of similar food-stuffs being taken as a guide.

Having in this way calculated the digestible matter present in the actual average daily ration, it has been reduced to that per 1000 lb. live-weight, by taking the mean of the average weights of the animals at the beginning and end of the experiment.

In some few cases the coarse fodder (straw, &c.) has not been weighed and recorded. An assumption has therefore had to be made as to its probable amount. Such cases are few, and are clearly indicated in the table. Following the aggregate amount of digestible matter are the quantities of digestible albuminoids present, and the starch equivalent of the digestible carbohydrates, amides, fat, and fibre. This has been calculated thus—

Digestible carbohydrates + digestible fibre + 0.6 amides + 2.3 fat.

<sup>1</sup> An exception to this rule has been made in the case of the later Cambridge University experiments on the feeding values of different varieties of mangolds. Prof. Middleton's own figures have been used.

In most cases the aggregate value of the digestible proteids and the carbohydrate equivalent of the daily ration per 1000 lb. body-weight will be found to exceed the total digestible matter. The excess will be greater where much fat is present in the ration, while amides, conversely, tend to make the aggregate smaller. The difference, indeed, affords a rough measure of the amount of fat in the ration.

### *Albuminoid Ratio of the Diet.*

This has been calculated in the usual manner from the *digestible* constituents, amides being classed as non-albuminoids and as being equal to 0.6 times their weight of starch, and fat as being equivalent to 2.3 times the value of starch.

The ratio is thus—

Digestible real albuminoids (Proteins).

$2.3 \text{ (digestible fat)} + 0.6 \text{ (amides)} + \text{digestible carbohydrates} + \text{digestible fibre.}$

In the case of several papers where analyses of the foods used are given, no distinction has been made between true albuminoids and total nitrogenous constituents (*i.e.*, total nitrogen + 6.25). When foods generally rich in amides (*e.g.*, roots, grasses, silage, hay, &c.) are concerned, it has been thought best to adhere to the *average* figures as given in Warrington, rather than to use the analyses given. But with concentrated food-stuffs—cakes, grain, &c.—whenever possible, the figures quoted in the original paper have been used and the digestion co-efficients assumed.

### *Digestible Matter consumed per 1 lb. increase in live-weight.*

This, of course, is obtained by multiplying the digestible matter in the average daily ration by the number of days the experiment lasted, and dividing by the number of pounds of total average increase in live-weight per head. The first number gives the total digestible matter; the second (enclosed in brackets), with the fat and amides present, converted into their equivalent of starch.

### *Average Live-weight of the Animals per head during the Experiment.*

This is simply the mean of the average live-weights at the beginning and end of the experiment, and, like all other weighings, is given in pounds.

It will be seen that in the table (p. 218) summaries of 199 separate lots are given, representing nearly 1000 individual animals. An attempt to include all the experiments, records of which could be found and which were sufficiently detailed, has been made, but the compiler fears that many published trials must have been overlooked. For such omissions the reader's forbearance is solicited.

Two experiments (Nos. 128 and 129) have been included because of the unusually large daily increase in weight, though, for obvious reasons, the details of the rations cannot be calculated.

#### DISCUSSION OF THE RESULTS GIVEN IN THE TABLES.

The figures in the table (p. 218) have been calculated with care, but the amount of work involved in their preparation has been so great that errors may have crept in. The calculations have been made with the slide rule, and consequently can only claim to be accurate to three significant figures. However, bearing in mind the very rough approximations of even the most carefully determined digestion coefficients, this degree of accuracy is beyond what can be relied upon, while the variations in composition of the various food-stuffs also renders any reliance upon great accuracy impossible.

Regarded statistically, however, it is probable that the results may be accepted as a fairly reliable record of the effects of various methods of feeding, and may serve as a useful guide for the future. Age, breed, sex, health, previous history, and other circumstances, affect the results of feeding in any particular case, and even after all the external conditions affecting the animal have been taken into account, there still remains its own individuality, including its tastes, disposition,—whether contented or otherwise,—and its inborn aptitude or inaptitude to lay on fat. For these it is almost impossible to give any measurement, so that in feeding experiments, as in all investigations involving living beings, great uncertainty as to the result and variability, without any determinable cause, under apparently similar circumstances, must often present themselves.

#### *Average Daily Increase in Live-weight per head.*

This varies from 3·13 (Lot 77) to 0·28 (Lot 87); the average of all the lots is 1·803 lb.

The greatest increase (Lot 77) was obtained with six Short-horns in 1889-90 during a period of 110 days, the ration used

corresponding to a supply of 12·3 lb. digestible matter per 1000 lb. live-weight per day, and having an albuminoid ratio of 1:4·25, while the next highest (2·99 lb.) was obtained with four Shorthorn bullocks in 1870-1 during 98 days, the ration used corresponding to 15·7 lb. of digestible matter per 1000 lb. live-weight, and having an albuminoid ratio of 1:19·9 (Lot 26).

The smallest increase (0·28 lb.) was obtained with four Hereford bullocks (Lot 87) of average weight of 1091 lb. during 61 days in 1893-4, with a ration supplying 9·75 lb. of digestible matter per 1000 lb. live-weight, albuminoid ratio 1:4·75; in this case, however, linseed-oil was added to the chaff, &c., and apparently nauseated the animals, so that too much reliance cannot be placed on the result. The next lowest increase (0·38 lb.) was shown by Lot 58, two bullocks of an average of 1042 lb. live-weight, fed in 1883 for 60 days on a diet of wheat-straw and mangolds, giving only 7·4 lb. of digestible matter per 1000 lb. live-weight per day, and having an albuminoid ratio of 1:69·5. This experiment was not directed to the fattening of the animals, but to the preparation of manure.

The two lots (Nos. 128 and 129), each containing 10 Irish bullocks about three years old, which, in addition to their concentrated food, were at pasture, made the largest increase of all—viz., 3·26 and 3·66 lb. per day for 88 days. Obviously the average daily ration cannot be determined in these cases.

Arranging the remaining 199 lots in order of daily gain in steps of a quarter of a pound, the following table shows the distribution:—

Average daily gain per head.		Number of Lots	
Between 0·25 and 0·5	lb.	.	2
" 0·50 "	0·75 "	.	5
" 0·75 "	1·0 "	.	5
" 1·0 "	1·25 "	.	4
" 1·25 "	1·50 "	.	29
" 1·50 "	1·75 "	.	39
" 1·75 "	2·0 "	.	56
" 2·0 "	2·25 "	.	27
" 2·25 "	2·50 "	.	17
" 2·50 "	2·75 "	.	8
" 2·75 "	3·0 "	.	6
" 3·0 "	3·25 "	.	1
<hr/>			
199			

It will be seen that from 1·75 to 2·0 lb. per day is the most often occurring, while from 1·25 to 2·25 lb. per day includes 151 lots or about 75 per cent of all.

*Weight of Digestible Matter consumed per day per 1000 lb.  
live-weight.*

This averages for all the lots 13.92 lb., varying from 22.7 lb. (Lot 1) to 7.4 lb. (Lot 58).

The highest figures were obtained with three cattle fed for 89 days in 1833 (Lot 1); the ration—beans, potatoes, straw, and swedes—corresponded to 22.7 lb. digestible dry matter per 1000 lb. live-weight, and had an albuminoid ratio of 1:23.2; the animals, however, with an average live-weight of 1159 lb., increased at the rate of 2.55 lb. per day.

If we assume, with Kellner, that an animal of this weight requires about 6.4 lb. of digestible organic matter per 1000 lb. live-weight for maintenance only, there remains 16.3 lb. still available for fattening. If the figures are to be trusted, this is a very large amount; but nevertheless the animals utilised their food fairly well, for each pound of increase was obtained at the expense of 10 lb. of digestible matter consumed.

The next highest consumption was in more recent experiments (Lot 159), when three cattle were fed for 84 days in 1907-8, receiving an average ration corresponding to 19.8 lb. digestible matter per 1000 lb. live-weight. The animals—in this case very young—had an average weight of 847.5 lb., and made an increase at the rate of 1.80 lb. per head per day. The ration had an albuminoid ratio of 1:7.1, and each pound of increase consumed 9.3 lb. of digestible matter. Another large ration was used in 1873 (Lot 29), when four animals received food corresponding to 18.9 lb. digestible matter per 1000 lb. live-weight for 179 days. In that period they maintained an average rate of increase of 2.03 lb. per day, and their average live-weight during the experiment was 994 lb. Each pound of increase in this case consumed 9.2 lb. of digestible matter.

The smallest quantity of digestible matter per day was received by two cattle in 1883 (Lot 58), when for 60 days only 7.4 lb. digestible matter per day was given. In this case the animals, whose average weight was 1042 lb., only made increase at the rate of 0.38 lb. per day, but the ration had a very wide albuminoid ratio (1:69.5), and each pound of increase in live-weight was obtained at the expenditure of 20.6 lb. of digestible matter.

It is to be noted, however, that the figures given in the table are not, in all cases, comparable, since a variable proportion of the total digestible matter is fat, which has, whether for maintenance or production, a higher value (2.3 times) than carbohydrates or fibre. To render the results truly comparable, the

amounts of digestible non-albuminoid matters should be reduced to their equivalent in starch. This has been done, and is also given in the table (*v. infra*).

*The Amount of Digestible Albuminoids supplied per day per 1000 lb. live-weight.*

This varies between very wide limits—from 0·11 lb. (Lot 58) to 3·68 lb. (Lot 54), the average being 1·675 lb. In the case of Lot 58 it seems difficult to believe that the two bullocks could exist, much less increase in weight, with a ration so low in albuminoid matter as wheat-straw and mangolds are said to be; and it certainly seems probable that these substances are capable of supplying more albuminoids than they are usually believed to contain, or else that amides have some power of acting as a substitute for albuminoids. I believe there is some recent evidence in favour of the latter hypothesis.<sup>1</sup> Two other lots (*viz.*, Nos. 5 and 9) also received less than a quarter of a pound of digestible albuminoids per day per 1000 lb. live-weight, and the same remarks apply in these cases, especially as the rate of increase was much greater—0·96 lb. and 1·58 lb. per day respectively.

Arranging all the lots in series, rising by  $\frac{1}{4}$  lb. digestible albuminoids per day, the following table results:—

		Average gain per day in lb.		Digest. matter for 1 lb. in- crease.
Receiving less than	0·25 lb. per day	3 lots	0·97	13·53
„ between	0·25 and 0·5 „	6 „	1·70	7·95
„ „	0·50 and 0·75 „	9 „	1·69	8·92
„ „	0·75 and 1·0 „	12 „	1·95	8·62
„ „	1·0 and 1·25 „	20 „	1·80	8·72
„ „	1·25 and 1·50 „	25 „	1·82	8·65
„ „	1·50 and 1·75 „	28 „	1·72	9·60
„ „	1·75 and 2·0 „	39 „	1·85	9·36
„ „	2·0 and 2·25 „	19 „	1·86	8·29
„ „	2·25 and 2·50 „	18 „	1·85	8·27
„ „	2·50 and 2·75 „	12 „	1·93	8·38
„ „	2·75 and 3·0 „	4 „	2·00	8·93
„ „	3·0 and 3·25 „	3 „	1·57	8·90
„ above	3·25 „	1 lot	1·19	11·30

It is difficult to draw any definite conclusion as to the most suitable amount of albuminoids, since there are two maxima in

<sup>1</sup> Brutschus, *Exper. Station Record*, 1899, 275.

the average daily gain—with about 1·0 lb. digestible albuminoids per day, and with about 2·75 lb.; and two minima in the weight of digestible matter consumed per 1 lb. increase—viz., with about 0·5 lb., and with about 2·5 lb. of digestible albuminoids per day.

Between 1·0 and 2·0 lb. per day was given in about 55 per cent of the trials, while between 0·75 and 2·5 lb. includes about 80 per cent.

*Amount of Albuminoids and Starch Equivalent per day  
per 1000 lb. live-weight.*

The sum of these two constituents differs from the actual total weight of digestible matter, in most cases, for the reasons already given.

The value varies from 7·42 (Lot 58) to 22·74 (Lot 1), being distributed as follows:—

Between	7 and 8 lb. per day	1 lot	average increase per day	0·38 lb.
„	8 and 9 „	2 lots	„	1·86 „
„	9 and 10 „	4 „	„	2·02 „
„	10 and 11 „	9 „	„	1·82 „
„	11 and 12 „	28 „	„	1·78 „
„	12 and 13 „	25 „	„	1·72 „
„	13 and 14 „	24 „	„	1·80 „
„	14 and 15 „	15 „	„	1·62 „
„	15 and 16 „	27 „	„	1·81 „
„	16 and 17 „	27 „	„	1·87 „
„	17 and 18 „	21 „	„	1·86 „
„	18 and 19 „	11 „	„	1·87 „
„	19 and 20 „	3 „	„	1·89 „
„	20 and 21 „	1 lot	„	1·80 „
„	21 and 23 „	1 „	„	2·55 „

199

The mean value for the whole 199 lots is 14·46 lb.

Here again it is impossible to correlate the figures with the average daily increase. No particular value appears to have been preferred, but a total of between 11 and 18 lb. per day includes over 80 per cent of all the experiments.

The average of the starch equivalent of the non-albuminoids of the daily rations per 1000 lb. live-weight is 12·79 lb., and varies from 7·31 (Lot 58) to 17·75 lb. (Lot 123).

*Albuminoid Ratios of the Rations used.*

These, as is to be expected, show great variation, the widest (1:69·5) being in the case of Lot 58, where the ration consisted

merely of wheat-straw and mangolds.<sup>1</sup> The narrowest (1:2·7) was possessed by the ration used in Lot 54, where two animals, of average live-weight 1123 lb., were fed for 46 days on a ration of decorticated cotton-cake, wheat-straw, and mangolds, yielding 11·9 lb. of digestible matter per 1000 lb. per day.

The diet was apparently not very suitable, for the increase per head amounted to an average of only 1·19 lb. per day.

The average of all the albuminoid ratios of the lots was about 1:9·8. An examination of the table, however, will show that similar rates of increase have been obtained with rations possessing very different albuminoid ratios.

But where the ratio is very wide or very narrow, the rate of increase is, as a rule, low. Thus the average rate of increase of the five lots whose rations have an albuminoid ratio wider than 1:40 is only 1·05 lb. per day per head; while in the eight cases where the ratio is narrower than 1:4, the average rate is only 1·52; whereas it has been shown that the average of the whole 199 lots, with a mean ratio of 1:9·8, is 1·803.

While the average of all the albuminoid ratios is, as above stated, 1:9·8,<sup>2</sup> the mean figures, deduced from the average amounts of albuminoids and starch equivalents of the rations (viz., 1·675 lb. and 12·79 lb. respectively) are 1:7·65. This value represents more closely the true average.

*Amount of Digestible Matter consumed for each pound of live-weight increase.*

This is perhaps the most important measure of success in a feeding trial.

In the cases quoted in the tables it varies from as high as 36 lb. to as low as 3·64 (Lot 61, which, as the trial only occupied 24 days, is perhaps not very trustworthy).

The other very low figures, with the exception of these for Lot 69 (4·5), which again was obtained in the short period of 28 days, are mainly in the cases where very young animals have been used, and the results represent growth rather than

<sup>1</sup> As already stated, it seems probable that the ration contained more albuminoids than these food-stuffs are usually said to contain, or else that amides can, to some extent, act as substitutes for albuminoids. The albuminoid ratio, therefore, was really probably not so wide as stated.

<sup>2</sup> Calculated thus—

Let  $1:x$  represent mean, then  $x = \frac{a+b+c+\dots}{n}$  when  $1:a, 1:b, 1:c, \&c. =$  albuminoid ratios of individual rations  $\times n =$  total number of lots. Since albuminoid ratios are really fractions, this method of calculating a mean is incorrect (though, I fear, sometimes used), and the ratio 1:7·65 is really the average.

fattening. The mean amount for all the lots is 9.00 lb. The 199 lots were thus distributed :—

Consuming above	30 lb. digestible matter for 1 lb. increase	1 lot
from 20 to 30	" " "	1 "
" " 15 to 20	" " "	3 lots
" " 13 to 15	" " "	2 "
" " 12 to 13	" " "	8 "
" " 11 to 12	" " "	13 "
" " 10 to 11	" " "	27 "
" " 9 to 10	" " "	41 "
" " 8 to 9	" " "	29 "
" " 7 to 8	" " "	30 "
" " 6 to 7	" " "	29 "
" " 5 to 6	" " "	12 "
" " 4 to 5	" " "	2 "
" " 3 to 4	" " "	1 lot
		—
		199

It is seen that between 9 and 10 lb. represents the most usual figures, while between 6 and 11 lb. includes more than 78 per cent of the whole, and from 7 to 10 lb. includes more than half the cases.

The above figures refer to the *total* digestible matter in the daily rations, not to their starch equivalents. If the aggregate of the digestible albuminoids and the starch equivalents of the fat, carbohydrates, amides, and fibre be taken, the distribution is slightly different, being as follows :—

Consuming above	30 lb. of this corrected total	1 lot
between 20 and 30	" "	1 "
" " 15 and 20	" "	3 lots
" " 13 and 15	" "	5 "
" " 12 and 13	" "	11 "
" " 11 and 12	" "	12 "
" " 10 and 11	" "	34 "
" " 9 and 10	" "	40 "
" " 8 and 9	" "	26 "
" " 7 and 8	" "	31 "
" " 6 and 7	" "	24 "
" " 5 and 6	" "	9 "
" " 4 and 5	" "	1 lot
" " 3 and 4	" "	1 "
		—
		199

The mean amount for all the lots is 9.343, or if the abnormal Lot 87 (consuming 43.8 lb. for each 1 lb. of increase) be excluded, the mean is 9.169 lb.

*Influence of Age of Animals upon Feeding.*

In many cases details of the age, sex, and breed of the animals used are given by the authors of the original papers. Whenever possible these are given in the large table.

Arranging the various lots according to age, the following table results:—

Approximate age of animals.	Number of Lots.	Average daily gain per head.
6 months	8	1.25 lb.
12 "	14	1.63 "
18 "	11	1.83 "
2 years	51	1.79 "
2½ "	18	1.86 "
3 "	40	2.04 "
4 "	2	1.46 "
<hr/>		
144		

The average daily gain per head of the 144 lots was 1.821 lb. The highest average gain was shown by the three-year-olds, which were, relatively, large beasts. A better criterion would be the quantity of albuminoids + starch equivalent of the other food constituents consumed per 1 lb. of live-weight increase. These are as follows:—

6 months old	8 lots consuming	8.17 lb. for 1 lb. increase.		
12 "	14 "	8.15	"	"
18 "	11 "	8.71	"	"
2 years	51 "	9.99	"	"
2½ "	18 "	8.97	"	"
3 "	38 "	8.55	"	"
4 "	2 "	9.80	"	"
<hr/>				
142				

The average amount consumed by the 142 lots was 9.09 lb. of albuminoids and carbohydrates, &c. (expressed in starch equivalents).

As is to be expected, the younger animals made increase with less consumption of food, but for some reason the three-years-old cattle appear to have utilised their food better than those two years old.

*Influence of Sex.*

In only 12 lots were heifers exclusively used, the remainder being either all bullocks or, in a few cases, partly heifers and partly bullocks.

It would manifestly be unwise to attach much importance

to figures derived from so few experiments, but the average daily gain of the 12 lots composed of heifers was 2·036 lb. per head, a result decidedly higher than the average of all the lots—viz., 1·803 lb.; while the average weight of albuminoids + starch equivalent of the rest of the food consumed per 1 lb. increase in live-weight was only 7·475 lb., as against 9·343 lb. as the mean for the whole 199 lots.<sup>1</sup>

### *Influence of Breed.*

In many cases the breed of the animals used is stated in the original papers. This is indicated, when obtainable, in the large table.

Taking the cases where all the animals in a lot are of the same breed or variety, the following gives a summary:—

Breed.	Number of Lots.	Average daily gain per head.
Shorthorn	39	2·08 lb.
Hereford	40	1·793 „
Irish cross-breeds	26	1·96 „ <sup>2</sup>
Galloway	20	1·52 „
Welsh	14	1·86 „
“Blue-greys”	12	1·50 „
Aberdeen-Angus	4	1·86 „
Norfolk Polled	3	1·82 „
Ayrshire	2	1·57 „

---

160

The average gain of all the 160 lots was 1·828 lb. per day per head.

The remaining lots were either different varieties of crosses or were made up of animals of more than one breed.

The Shorthorns give the best average gain, and the “Blue-greys” the poorest; but it is to be noted that among the latter were many very young beasts, so that comparisons based on these results are not trustworthy data by which to estimate relative fattening qualities of the various breeds.

The superiority of the Shorthorn, however, seems clearly indicated, and doubtless in most of the so-called Irish crosses Shorthorn blood predominated.

Taking the aggregate amounts of digestible albuminoids, and the starch equivalents of the digestible fat, carbohydrates, fibre,

<sup>1</sup> It is perhaps fair to point out that the heifers include Lots 44 to 47—experiments conducted by A. Templeton in 1853-4, as to whose accuracy Lawes and Gilbert express some doubt. The results recorded by Templeton are certainly surprisingly good for such small rations. But even if these four lots be excluded, the heifers appear to have done better than the bullocks.

<sup>2</sup> Or 24 lots with average daily gain of 1·84 lb., if Lots 128 and 129 (on pasture) be excluded.

and amides in the food consumed for each pound of increase, a better criterion of feeding capacity is obtained.

The results expressed in this way are as follows:—

Breed.	Number of Lots.	Food constituents consumed per 1 lb. increase.
Shorthorn	39	8·533 lb.
Hereford	40	9·74 „ <sup>1</sup>
Irish cross-breds	24	10·32 „
Galloway	20	10·185 „
Welsh	14	10·257 „
“Blue-greys”	12	8·858 „
Aberdeen-Angus	4	8·375 „
Norfolk Polled	3	10·50 „
Ayrshire	2	10·20 „

158

The mean of all the 158 lots is 9·551 lb. of digestible albuminoids and “starch equivalent” per 1 lb. increase, or excluding Lot 87, is 9·332 lb.

It would appear from the above table that for utilising the food supplied the greatest aptitude is shown by the Aberdeen-Angus (the number of experiments, however, is not large enough to be conclusive on this point), followed by the Shorthorn, Hereford, “Blue-grey,” Galloway, Ayrshire, Welsh, Irish crosses, and Norfolk Polled, in the order given. Too much reliance, however, should not be attached to this conclusion, as the conditions of feeding, &c., have been so varied.

#### REMARKS ON SOME OF THE FOOD-STUFFS USED.

If time permitted, it might be possible to deduce various useful generalisations from a study of the figures given in the table, and in the original papers numerous deductions are to be found as to the advantages and disadvantages of various food-stuffs.

A few additional points have occurred to the compiler in studying the tables. Among them the following may be here alluded to:—

I. That, as a rule,—to which, however, there are a few exceptions,—the quantity of digestible matter supplied per day has been much larger in the recent experiments than in the earlier ones.

II. That beans, which were formerly often used in feeding cattle, have in the recent experiments been rarely used. In the table, beans or bean-meal have entered into the rations of 25 lots. The average gain per day of these lots was 1·935 lb.

<sup>1</sup> If the very abnormal lot (No. 87) be excluded, the mean for the 39 lots of Herefords is only 8·636 lb.

(as against 1·803 lb. as the average of all), but the average weight of food consumed per 1 lb. of increase was 9·368 lb. (as compared with 9·00 lb. as the average of all). Perhaps this indicates that beans are palatable, and enable the animals to eat largely, but not very economical in laying on flesh.

### *Superiority of Leguminous Fodders.*

III. The success of rations in which clover-hay occurs in considerable quantity.

In looking over the rations which have been used by the various experimenters, it is noteworthy that wherever leguminous fodders have been used, the results have been, as a rule, good. Clover-hay is almost the only representative of this class of foods which occurs in the table.

Thus in the 17 cases where clover-hay formed a constituent of the daily ration, the average amount of digestible matter consumed per 1 lb. of increase of live-weight was only 7·47 lb., and if two of these, Nos. 48 and 52, be excluded, the value becomes only 7·01 lb., while the average daily gain per head of the animals is 2·13 lb.

These figures compare very favourably with the means of the whole, which are 9 lb. and 1·803 lb. respectively.

This is a significant result, and worthy of note by cattle-feeders.

The good effects of clover-hay as a constituent of a feeding ration is doubtless partly due to its high content of albuminoids, but in the writer's opinion is probably connected with the nature and amount of its ash constituents. The writer has recently called attention to the importance of the relative proportions of lime and phosphoric acid in the food of animals, especially with reference to bone development and nutrition,<sup>1</sup> and has shown that a diet composed wholly of cereals furnishes a large excess of phosphoric acid as compared with lime, and to this circumstance he attributes the prevalence of certain bone diseases among horses and mules fed entirely upon oat-hay, or oat-hay and maize.

Now in almost all seeds (cereal grain, oil-cakes, &c.) used as foods, the phosphoric acid greatly exceeds the lime in amount, while in the straw of wheat, barley, and oats there is only a slight preponderance of lime. In potatoes and mangolds, according to Warrington, the phosphoric acid exceeds the lime, though swedes and turnips are said to contain a slight excess of lime over phosphoric acid. In rations consisting of oil-cakes, cereal grains, cereal straw, and roots, there will thus generally be present much more phosphoric acid than lime,

<sup>1</sup> Vide 'Journal of Comparative Pathology and Therapeutics,' March, 1907.

and such a condition does not favour bone development or nutrition.

Leguminous fodders, on the other hand, contain an overwhelming excess of lime over phosphoric acid, and to the writer it appears probable that for this reason the inclusion of clover-hay in feeding rations must have a beneficial effect upon growth and development.<sup>1</sup>

*Respective Merits of Linseed, Decorticated Cotton-seed,  
and Common Cotton-seed Cakes.*

The best way of judging these appeared to be to take the various trials in sets, and compare the average daily gain and consumption of digestible matter per 1 lb. increase.

*Linseed-cake.*

There are 49 lots in which 3 lb. or more of linseed-cake have entered into the daily ration. These give an average daily gain of 1·873 lb. per head, and a consumption of albuminoids and starch equivalent of the non-albuminoid constituents per 1 lb. of increase of 9·086 lb.

*Decorticated Cotton-cake.*

There were 52 lots into whose rations 3 lb. or more per day of this food entered, and the average daily gain and consumption of digestible matter were 1·818 lb. and 9·90 lb. respectively. Neglecting Lot 87, with its very abnormal results, the figures become 1·846 lb. and 9·235 lb. respectively.

*Common Cotton-cake.*

The figures for the 26 lots receiving 3 lb. or more daily of this food are 1·850 lb. and 9·942 lb. respectively.

Summarising—

3 lb. or more of	Number of Lots.	Average daily gain.	Average weight of digestible matter per 1 lb. increase.
Linseed-cake . . . .	49	1·873 lb.	9·086 lb.
Decorticated cotton-cake .	51	1·846 „	9·235 „
Common cotton-cake .	26	1·850 „	9·942 „

<sup>1</sup> Vide "The Mineral Constituents of Food," 'Jour. of Agric. Science,' Dec., 1908.

The differences are not very marked, but linseed-cake seems to be distinctly superior to the other two cakes, both in giving greater daily increase and in producing this with less consumption of digestible matter.

*Use of Large Quantities of Roots in the Daily Rations.*

If the table be examined, it will be found that 43 lots received 100 lb. or more of roots per day. The average daily gain of these 43 lots is 1·821 lb. per head (as compared with the average of all—viz., 1·803 lb.), while the consumption of digestible albuminoids and starch equivalent of the other organic constituents was on the average 10·03 lb. (as against 9·343 lb. as the average of the whole 199 lots).

When over 100 lb. per day of roots have been used, the average daily gain has thus been slightly above the average, but has been obtained at the expenditure of distinctly more digestible matter.

Several of the authors of the original papers conclude that it is a profitable practice to allow animals as many roots as they will eat, provided that a sufficiency of concentrated food is also supplied. In 16 lots no roots were given; the average daily gain varied from 2·38 lb. to 0·28 lb., or if No. 87 be omitted, to 0·59 lb., the average of the 15 lots being only 1·51 lb. The average weight of digestible matter (corrected for fat, amides, &c.) per 1 lb. increase was 9·9 lb.

In 6 lots fed without roots silage was given; the average daily gain of these 6 lots was 1·80 lb. per head, and the average consumption of albuminoids and carbohydrates per 1 lb. increase was only 7·63 lb.

This is high testimony to the feeding value of silage as compared with roots.

*Influence of Housing.*

Several of the trials were made to compare the rate of increase of cattle kept in stalls, loose-boxes, or open sheds and yards.

The results are not entirely consistent, but the general indication appears to be that more food per day is consumed when the animals have exercise and abundance of fresh air, that they make a greater daily gain in weight, and that each pound of increase is obtained with about the same consumption of digestible matter.

Thus in Lots 24, 25, and 26 the results were—

Lot.	Housed in	Average daily gain.	Digestible matter per day per 1000 lb.	Digestible matter consumed per 1 lb. increase.
24	Stalls . .	2.52 lb.	11.88 lb.	6.8 lb.
25	Boxes . .	2.90 „	13.36 „	6.8 „
26	Sheds . .	2.99 „	15.96 „	7.8 „

While in lots 103 to 106—

103	Boxes . .	1.50 lb.	11.74 lb.	9.6 lb.
105	„	1.98 „	12.32 „	7.7 „
104	Yards . .	1.94 „	10.73 „	7.6 „
106	„ . .	2.38 „	11.53 „	6.7 „

The number of experiments, however, is not large enough to allow of much reliance being placed upon the results.

### *Influence of Cooking Food.*

Several of the earlier trials were intended to determine whether any advantage attended cooking the food, and although in some cases cooking was apparently economical so far as the production of increase from a given weight of food is concerned, the general conclusion arrived at by the experimenters was that it did not pay.

### *Suggested Ration for Fattening Cattle.*

It may be regarded as presumptuous to make any recommendations to the practical farmer as to feeding methods, but from careful consideration of the large mass of material here gathered together, the writer would suggest as a daily ration likely to give good results, some such mixture as the following, the figures being suitable for an animal of about 1000 lb. live-weight, and the food-stuffs assumed to be of average composition :—

Linseed-cake . . . . .	3 lb.
Decorticated cotton-cake . . . . .	3 „
Clover-hay chaff . . . . .	10 „
Maize or barley-meal . . . . .	2 „
Oat-straw chaffed . . . . .	5 „
Roots . . . . .	40 „

This would provide about—

2.55 lb.	digestible	proteids,
.99	"	" fat,
11.58	"	" carbohydrates, fibre, and amides,

or 2.55 lb. proteids and 13.86 lb. of other digestible matter expressed as starch. It would have an albuminoid ratio of about 1:5.45.

Instead of the linseed-cake an equal weight of bean-meal might be substituted, and grass or oat silage (say, 35 to 40 lb.) might replace the roots. The addition of 3 or 4 oz. of common salt per day to the ration would probably also be an improvement, as tending to correct the preponderance of potash over soda, which most vegetable foods possess.

In the early period of fattening, too, the linseed-cake might be largely replaced by decorticated cotton-cake, and an increased supply of roots provided if the cattle would eat them.

In conclusion, the compiler would express his regret that time does not permit of discussing more fully many points of interest which the results suggest, but trusts that the very concise form into which an enormous amount of work has been condensed, at the expense of much labour and time, may prove of service to those interested in the feeding of cattle.

He would also acknowledge with gratitude the help which he has received from the Secretary of the Highland and Agricultural Society of Scotland, by the loan of journals, reprints, &c., from which the abstracts have been made.

#### APPENDIX.

##### *Experiments not appearing in the Table.*

In addition to many experiments which have probably been entirely overlooked in preparing this compilation, there are several papers on feeding trials which have been carefully examined, but which have not been deemed suitable for abstraction.

In some cases the rations used were not fully recorded, so that the average daily ration could not be deduced from the data given, while in others the results were so inconclusive that no definite deductions could be drawn. Mention may be made of a few experiments which were not inserted in the table.

I. In 1890-1 experiments intended to test the efficacy of "cattle spice" were described by Mr J. Milne ('Transactions,' 1892).

The results showed little, if any, advantage to accrue from the addition to the ordinary food of condiments, whether bought as aniseed, fenugreek, caraway, and coriander, and mixed, or purchased as commercial "cattle spice."

## INCREASE IN LIVE-WEIGHT IN LB.

	Ordinary food.	Ordinary food with 2 oz. daily of spice.
For 84 days.		
Irish bullocks . . . . .	$\left. \begin{matrix} 193 \\ 163 \\ 162 \\ 162 \end{matrix} \right\} 170$	$\left. \begin{matrix} 203 \\ 190 \\ 167 \\ 161 \end{matrix} \right\} 180.25$
For 56 days.		
Canadian bullocks . . . . .	$\left. \begin{matrix} 146 \\ 115 \\ 103 \\ 77 \end{matrix} \right\} 110.25$	$\left. \begin{matrix} 134 \\ 132 \\ 112 \\ 77 \end{matrix} \right\} 113.25$
For 63 days.		
Irish bullocks . . . . .	$\left. \begin{matrix} 128 \\ 127 \\ 89 \\ 52 \end{matrix} \right\} 99$	$\left. \begin{matrix} 143 \\ 131 \\ 126 \\ 112 \end{matrix} \right\} 128$
For 84 days.		
Irish bullocks . . . . .	$\left. \begin{matrix} 125 \\ 106 \\ 98 \\ 35 \end{matrix} \right\} 91$	$\left. \begin{matrix} 156 \\ 137 \\ 100 \\ 83 \end{matrix} \right\} 119$
For 91 days.		
Black Polled heifers . . . . .	$\left. \begin{matrix} 168 \\ 156 \\ 110 \\ 79 \end{matrix} \right\} 128.25$	$\left. \begin{matrix} 134 \\ 123 \\ 108 \\ 67 \end{matrix} \right\} 108$
For 56 days.		
Canadian cattle . . . . .	$\left. \begin{matrix} 168 \\ 142 \\ 131 \\ 98 \end{matrix} \right\} 134.75$	$\left. \begin{matrix} 166 \\ 161 \\ 117 \\ 105 \end{matrix} \right\} 137.25$
434 days . . . . .	733.25	785.75
Per day . . . . .	1.69	1.82

Showing a slight advantage to the lots receiving "spice."

II. At the South-Eastern Agricultural College, Wye, in 1907-8, an experiment to determine the value of molascuit as a substitute for roots was made, but the data published in the report (1908) are not sufficient to allow of a full account of the amounts of food used being made out.

Five beasts, a Shorthorn, Hereford, Polled, Sussex, and Devon, of average weight of 9 cwt. 1 qr. 15 lb., were fed on—

Linseed-cake . . . . .	2 to 3 lb.
Bombay cotton-cake . . . . .	2 " 3 "
Rice-meal . . . . .	2 " 3 "
Chaffed straw . . . . .	5 " 8 "
Hay . . . . .	5 " 6 "
Roots . . . . .	35 " 56 "

for about 4 months (exact time not given), and made an average gain of 2.13 lb. per day per head (varied from 1.42 to 2.71 lb. in different animals).

Five similar animals, with an average weight of 9 cwt. 1 qr. 17 lb., were fed upon similar diet, except that the swedes and mangolds were replaced by molascuit at the rate of 1 lb. of molascuit for 14 lb. of roots, and they each had 3 lb. more straw-chaff daily.

The average daily increase was 1.49 lb. per head, varying from 1.0 to 1.82 lb.

The Shorthorns were apparently sold 11 weeks after the beginning of the experiment, the Herefords after 17 weeks, the Polled cattle after 18 weeks, the Sussex after 22½ weeks, and the Devon after 13½ weeks.

The average daily gains from month to month appear to have been very irregular: thus the Sussex in Lot I. gave 5.22 lb. per day for the first month, 2.96 lb. for the second month, 1.65 lb. for the third month, and 0.78 lb. for the fourth month.

The average profit on Lot I. (roots) was estimated at 11s. 2½d., the average loss on Lot II. (molascuit) at £1, 13s. 7½d. But the Shorthorn in Lot I. made £3, 8s. 6d. profit, while the Devon lost 18s. 10d. No safe conclusion can be drawn from this experiment.

[TABLES.

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Duration in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.			Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible am. carbohydrates, millet, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of rest of digest. matter.			
1. R. Walker . .	1883	* A 1835	3 2 years old Heifers Shorthorn cross	89	226.3	2.55	Beans 3 Potatoes 20 Straw 7 Swedes 200 Cooked	1.09	25.32	22.7	0.94	21.80	1: 23.2	+ 10.0 (10.0)	1159
2. R. Walker . .	1883	A 1835	3 2 years Heifers Shorthorn cross	89	212.3	2.38	Beans 3 Potatoes 20 Straw 7 Swedes 135 Raw	0.97	19.89	18.1	0.85	17.4	1: 20.5	8.65 (8.8)	1144.5
3. R. Stephenson .	1884	A 1839	6 Rising 2 years Bullocks Not stated	119	252	2.11	Linseed-cake 3.26 Beans 3 Potatoes 4.03 Oats 1.46 Swedes 123	1.63	15.30	13.3	1.29	12.15	1: 9.4	8.0 (8.0)	1260
4. R. Stephenson .	1884	A 1839	6 Rising 2 years Bullocks Not stated	119	235.6	1.97	Beans 3 Oats 1.46 Potatoes 2.01 Swedes 129	0.98	13.62	12.8	0.85	11.33	1: 13.9	6.48 (7.4)	1151
5. R. Stephenson .	1884	A 1839	6 Rising 2 years Bullocks Not stated	119	114.3	0.96	Swedes 109	0.22	9.08	10.9	0.26	10.5	1: 40.8	9.9 (9.70)	866
6. D. McCulloch .	1882-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	151	1.51	Bean meal 4 Oat straw 7 Mangolds 95	0.93	13.04	13.9	0.92	12.9	1: 14.0	9.30 (9.30)	1010

7. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	149	1.49	Bean meal 4 Oat straw 7 Swedes 180	1.09	15.66	16.8	1.08	15.6	1 : 14.3	11.30 (11.30)	1008
8. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	156.7	1.57	Oil-cake 3.67 Oat straw 7 Swedes 180	1.16	14.35	16.1	1.14	14.1	1 : 12.4	10.42 (10.0)	1017
9. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	157.7	1.53	Oat straw 7 Mangolds 120	0.23	13.59	13.5	0.23	13.38	1 : 60.5	8.70 (8.8)	1014
10. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	143	1.43	Oat straw 7 Swedes 150	0.35	15.18	15.86	0.35	15.14	1 : 48.0	11.0 (10.9)	1003
11. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	170	1.70	Bean meal 4 } Cut straw 3 } Oat straw 7 } Swedes 100	1.05	14.94	15.21	1.03	14.10	1 : 13.6	9.10 (9.1)	1016
12. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	154	1.54	Bean meal 4 } Cut straw 3 } Oat straw 7 } Mangolds 80	0.97	13.57	14.55	0.97	13.57	1 : 14.0	9.56 (9.5)	1009
13. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	161	1.61	Bean meal 3 } Rape-cake 2.3 } Cut straw 3 } Oat straw 7 } Small-man- golds 75	1.39	14.21	15.42	1.39	14.20	1 : 10.21	9.67 (9.7)	1006

\* For key to references, see page 197.

† The figures within brackets in this column (10.0) represent the digestible matter with the fat and amides converted into their equivalent of starch.

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.				Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of feed or digest. matter.				
14. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	143	1.43	Bean meal 3 } Rape-cake 2.3 } Cut straw 3 } Oat straw 7 Largeman- golds 75	1.82	12.80	14.24	1.34	13.0	1 : 9.77	9.84 (9.9)	986	
15. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	181	1.81	Beans 3 } Rape-cake 2.3 } Hay, cut green 7 Swedes 100	1.84	16.74	18.75	1.87	16.96	1 : 9.1	10.2 (10.3)	988	
16. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	178	1.78	As above, but hay cut in flower	1.70	16.69	18.75	1.75	17.10	1 : 9.8	10.3 (10.3)	975	
17. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	143	1.43	As above, but hay cut ripe	1.61	16.51	18.75	1.66	17.1	1 : 10.3	12.7 (12.7)	969	
18. D. M'Culloch .	1852-3	A 1855	3 two 2 years one 3 years Bullocks Galloway	100	171	1.71	As above, but 7 lb. oat straw in- stead of hay	1.47	16.17	17.80	1.49	16.4	1 : 11.0	10.3 (10.3)	986	

19. W. Horn .	1855-9	A 1861	2 Bullocks Shorthorn and Ayrshire cross	122	359	2.94	Bruised lin- seed 4.05 Chaff 4 Hay 6 Swedes 45 Mangolds 45	1.35	15.89	10.42	0.90	10.32	1 : 11.5	5.5 (5.9)	1837.5
20. W. Horn .	1858-9	A 1861	2 Bullocks Shorthorn and Ayrshire cross	122	329.5	2.63	Wheat meal 3 Barley meal 3 Chaff 4 Hay 6 Swedes 45 Mangolds 45	1.05	16.53	11.8	0.70	11.0	1 : 15.8	6.6 (6.6)	1509
21. W. Horn .	1858-9	A 1861	2 Bullocks Shorthorn and Ayrshire cross	122	318.5	2.60	Oil-cake 5 Chaff 4 Hay 6 Swedes 45 Mangolds 45	1.71	15.2	10.8	1.11	9.9	1 : 8.9	6.4 (6.5)	1536
22. R. J. Thomson	1864-5	A 1869	2 Ayrshire	28	49	1.75	Bean meal 4 Hay 13 Swedes 70	1.44	13.97	16.8	1.53	15.32	1 : 9.7	8.75 (8.8)	911
23. R. J. Thomson	1864-5	A 1869	2 Ayrshire	28	39	1.39	Bean meal 4 Hay 13 Mangolds 70	1.40	14.79	17.8	1.54	16.20	1 : 10.6	11.65 (11.6)	911
24. W. J. Moecrop	1870-1	A 1872	4 (In stalls) 24 years Bullocks Shorthorn	98	246.75	2.52	Linseed-cake 2.43 Indian meal 2 Straw chaff 10.3 Swedes 114	0.97	15.97	11.65	0.68	11.20	1 : 16.5	6.6 (6.8)	1425
25. W. J. Moecrop	1870-1	A 1872	4 (In boxes) 24 years Bullocks Shorthorn	98	285.25	2.90	Linseed-cake 2.43 Maize meal 2 Straw chaff 11.3 Swedes 141	1.03	18.55	13.17	0.71	12.65	1 : 18.0	6.87 (6.80)	1462
26. W. J. Moecrop	1870-1	A 1872	4 (In sheds) 24 years Bullocks Shorthorn	98	292.25	2.99	Linseed-cake 2.43 Maize meal 2 Straw chaff 14.1 Swedes 171	1.11	22.07	15.7	0.76	15.20	1 : 19.9	7.66 (7.80)	1452

Experimenter.	Date.	Reference.	No. of animals per lot. Age. Sex. Breed.	Duration in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.				Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live-weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of food.	Digest. matter.			
27. A. Harwood	1873	A 1874	4 2 years Bullocks Shorthorn	172	357	2.07	Linseed-cake 8.1 Tares and rye chaff 20.6 Barley straw 6.8 Beets 38.1	2.42	14.51	18.1	2.62	15.70	8.20 (8.70)	1: 6.0	820 (8.70)	927.5
28. A. Harwood	1873	A 1874	4 2 years Bullocks Shorthorn	172	378	2.20	Common cotton-cake 12.8 Tares and rye chaff 20.6 Barley straw 7.1 Beets 37.7	2.48	14.43	16.50	2.54	14.78	7.34 (7.7)	1: 5.83	734 (7.7)	978
29. A. Harwood	1873	A 1874	4 2 years Bullocks Shorthorn	179	364	2.03	Bean meal 10.6 Tares and rye chaff 21.4 Barley straw 7.2 Beets 36.3	2.65	15.95	18.9	2.75	16.05	9.22 (9.20)	1: 8.4	922 (9.20)	994
30. A. Harwood	1873	A 1874	4 2 years Bullocks Shorthorn	179	252	1.42	Bean meal 7.1 Linseed 3.3 Barley straw 13.6	2.12	12.44	14.9	2.30	14.12	9.3 (10.2)	1: 5.9	93 (10.2)	882
31. A. Harwood	1873	A 1874	2 2 years Bullocks Shorthorn	193	385	1.99	Common cotton-cake 6.7 Bean meal 6.7 Tares and rye chaff 21.5 Barley straw 6.4 Beets 33.6	2.93	15.12	18.0	3.03	15.61	8.75 (9.1)	1: 5.2	875 (9.1)	969.5

32. A. P. Attkin .	1895-6	A	1897	10 16 months { 6 bullocks { 4 heifers { 8 Irish { 2 polled	112	124.2	1.11	Dec. cotton- cake 7.25 Oat straw 8.5 Turnips 50	3.1	9.1	11.0	3.13	9.20	1: 3.0	9.83 (11.0)	990
33. A. P. Attkin .	1895-6	A	1897	10 16 months { 6 bullocks { 4 heifers { 8 Irish { 2 polled	112	148.7	1.33	Dec. cotton- cake 3.62 Dried Brewers' grains 5.75 Oat straw 8.36 Turnips 50	2.5	10.1	11.2	2.46	10.0	1: 4.0	3.65 (9.5)	1015
34. A. P. Attkin .	1895-6	A	1897	10 16 months { 6 bullocks { 4 heifers { 8 Irish { 2 polled	112	134.1	1.20	Linseed-cake 6.67 Oat straw 9.97 Turnips 50	2.2	9.7	10.9	2.18	9.63	1: 4.5	9.20 (10.0)	1007
35. A. P. Attkin .	1895-6	A	1897	10 16 months { 6 bullocks { 4 heifers { 8 Irish { 2 polled	112	159.6	1.42	Barley bran 10 Oat straw 9.08 Turnips 50	1.6	11.8	12.3	1.57	11.60	1: 7.4	8.79 (9.4)	1015
36. A. P. Attkin .	1895-6	A	1897	10 16 months { 6 bullocks { 4 heifers { 8 Irish { 2 polled	112	141.7	1.26	Oats 4 Maize 4.5 Oat straw 7.9 Turnips 50	1.1	10.9	11.3	1.10	10.98	1: 10.0	8.47 (9.5)	996
37. Col. M'Donnell .	1851-2	B	1852	3 24 years Bullocks Galloway	100	160	1.60	Bean meal 3.88 Oat straw 4 Wheat straw 1 Mangolds 84	0.92	11.96	12.82	0.90	11.75	1: 13.0	8.15 (8.0)	1018
38. Col. M'Donnell .	1851-2	B	1852	3 24 years Bullocks Galloway	100	167	1.67	Bean meal 3.88 Oat straw 4 Wheat straw 1 Carrots 108	1.22	12.90	13.1	1.16	12.30	1: 10.55	8.25 (8.5)	1050

Experimenter.	Date.	Refer-ence.	No. of animals per lot. Age. Sex. Breed.	Dura-tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.			Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live-weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of food or digest. matter.			
9. Col. M'Donnell.	1851-2	B 1852	3 2½ years Bullocks Galloway	100	164	1.64	Bean meal 3.88 Oat straw 4 Wheat straw 1 Swedes 120	1.03	13.97	14.5	0.99	13.40	1: 13.55	9.25 (9.2)	1045
10. Col. M'Donnell	1851-2	B 1852	3 2½ years Bullocks Galloway	100	143	1.43	Bean meal 3.88 } Oat straw 3 } Oat straw 4 } Wheat straw 1 } Swedes 84 } Cooked	0.97	12.09	12.7	0.93	11.62	1: 12.43	9.20 (9.1)	1037
11. Col. M'Donnell.	1851-2	B 1852	3 2½ years Bullocks Galloway	100	88	0.88	Oat straw 5.6 Wheat straw 1.4 Swedes 126	0.30	13.12	13.5	0.30	13.11	1: 44.0	15.4 (15.2)	1002
12. Col. M'Donnell.	1851-2	B 1852	3 2½ years Bullocks Galloway	100	116	1.16	Rye-grass 7 Hay 126 Swedes 126	0.55	13.51	13.85	0.54	13.3	1: 24.6	12.20 (12.1)	1019
13. Col. M'Donnell.	1851-2	B 1852	3 2½ years Bullocks Galloway	100	148	1.48	Oil-cake 3.02 Oat straw 4 Wheat straw 1 Swedes 114	0.96	13.09	13.40	0.92	12.50	1: 14.0	9.40 (9.5)	1043
14. A. Templeton *	1853-4	B 1855	3 2½ years Heifers Half-bred Short-horn	132	306	2.28	Hay 8 Oat straw 5.1 Swedes 66.3	0.49	11.13	9.86	0.42	9.50	1: 22.7	5.0 (5.1)	1173

45. A. Templeton *	1853-4	B 1855	3 2½ years Heifers Half-bred Short- horn	182	229	1.73	Hay Straw Swedes	8 5.1 62	0.48	10.78	10.11	0.43	9.73	1 : 22.5	6.5 (8.5)	1108
46. A. Templeton *	1853-4	B 1855	3 2½ years Heifers Half-bred Short- horn	182	252	1.90	Hay Straw Swedes	8 5.1 64	0.49	10.92	10.15	0.44	9.76	1 : 22.1	6.0 (6.0)	1120
47. A. Templeton *	1853-4	B 1855	3 2½ years Heifers Half-bred Short- horn	182	264	2.00	Hay Straw Swedes	8 5.1 63	0.49	10.83	9.71	0.42	9.30	1 : 22.2	5.66 (5.7)	1165
48. Lawes & Gilbert	1849	B 1861	11 Bullocks 6 Herefords 5 Devons	60	79	1.35	Oil-cake Clover hay Swedes	8.03 13.1 47.2	2.55	13.63	9.75	1.66	8.92	1 : 5.35	11.38 (12.0)	1531
49. Lawes & Gilbert	1849	B 1861	12 Bullocks 7 Herefords 5 Devons	60	111	1.85	Linseed com- pound meal Clover hay chaff Swedes	6.55† 12.35 48.53	1.65	13.64	9.30	1.08	8.90	1 : 8.26	7.72 (8.3)	1533
50. Lawes & Gilbert	1851	B 1861	5 Bullocks Hereford	57	168	2.95	Oil-cake com- pound meal Clover hay Swedes	4.92† 19.8 61.2	1.86	15.92	12.6	1.34	11.60	1 : 8.55	5.91 (6.0)	1383
51. Lawes & Gilbert	1851	B 1861	5 Bullocks Hereford	57	134	2.36	Linseed com- pound meal Clover hay Swedes	4.92§ 19.8 60	1.81	16.30	12.6	1.31	11.81	1 : 9.06	7.37 (7.7)	1378

\* The success of the feeding in these experiments, considering the food employed, is remarkable. It seems probable, as remarked by Lawes & Gilbert, that some mistake was made in the records of this trial.

† Linseed, ‡ : barley, § : beans, †.

‡ Oil-cake, † : barley, § : beans, †.

§ Linseed, † : barley, ‡ : beans, †.

Experimenter.	Date.	Refer-ence.	No. of animals per lot. Age. Sex. Breed.	Duration in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.		PER DAY PER 1000 LB. LIVE-WEIGHT.				Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live-weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible am., carbohydrates, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of feed or digest. matter.			
52. Lawes & Gilbert	1851	B 1861	6 Bullocks Hereford	36	61	1.69	Linseed meal 1.72 Barley meal 1.72 Bean meal 1.72 Clover hay 18.16 Swedes 66.16	1.76	16.36	12.7	1.28	11.80	1 : 9.4	10.3 (10.7)	1374
53. Lawes & Gilbert	1851	B 1861	5 Bullocks Hereford	35	97	2.77	Oil-cake 1.66 Barley meal 1.66 Bean meal 1.66 Clover hay 19.4 chaff 51.6 Swedes 51.6	1.79	15.49	11.1	1.20	10.35	1 : 8.65	6.0 (6.2)	1493
54. A. Voelcker	1881-2	B 1883	2 Bullocks Hereford (†)	46	54.5	1.19	Decort. cot- ton-cake 10.85 Wheatstraw chaff 13.60 Mangolds 10.85	4.12	10.95	11.9	3.68	9.75	1 : 2.7	11.25 (12.6)	1123
55. A. Voelcker	1881-2	B 1883	2 Bullocks Hereford (†)	46	69.5	1.51	Maize meal 10.85 Wheatstraw chaff 13.60 Mangolds 10.85	0.86	14.14	12.3	0.73	12.1	1 : 16.5	9.6 (10.0)	1171
56. A. Voelcker	1883	B 1884	2 Bullocks Hereford (†)	60	43.5	0.73	Decort. cot- ton-cake 7.7 Wheatstraw chaff 10.4 Mangolds 41.6	2.99	11.31	11.0	2.52	9.55	1 : 3.8	18.0 (19.6)	1187
57. A. Voelcker	1883	B 1884	2 Bullocks Hereford (†)	60	81.5	1.36	Maize meal 8.3 Wheatstraw 10.4 Mangolds 41.6	0.77	14.01	11.6	0.62	11.36	1 : 18.2	10.5 (10.9)	1233

58. A. Voelcker	1883	B 1884	2 Bullocks Hereford (?)	60	22.5	0.38	Wheatstraw chaff 10.4 Mangolds 41.6	0.11	7.62	7.4	0.11	7.31	1 : 69.5	20.6 (20.4)	1042
59. A. Voelcker	1883-4	B 1885	2 Bullocks Hereford (?)	63	104	1.65	Decort. cot- ton-cake 7.33 Wheatstraw chaff 10 Mangolds 39.7	2.56	10.63	10.7	2.29	9.52	1 : 4.16	7.25 (8.0)	1119
60. A. Voelcker	1883-4	B 1885	2 Bullocks Hereford (?)	63	114	1.82	Maize meal 7.94 Wheatstraw chaff 10 Mangolds 39.7	0.68	13.33	12.4	0.62	12.10	1 : 19.7	7.55 (7.7)	1101
61. A. Voelcker	1883	B 1885	4 Bullocks Hereford (?)	24	67	2.78	Decort. cot- ton-cake 2.93 Maize meal 4.65 Wheatstraw chaff 5.85 White tur- nips 35	1.49	9.26	9.8	1.44	8.96	1 : 6.2	3.64 (3.87)	1034
62. A. Voelcker	1885	B 1886	4 3 years Bullocks Hereford	113	260	2.80	Decort. cot- ton-cake 3 Maize meal 5 Hay 11 Swedes 45	2.02	14.0	11.7	1.54	10.7	1 : 6.9	6.65 (7.0)	1308
63. A. Voelcker	1885	B 1886	4 3 years Bullocks Hereford	113	232	2.05	Decort. cot- ton-cake 3 Maize meal 5 Sour silage 50	2.11	11.59	10.0	1.61	8.85	1 : 5.5	6.3 (6.8)	1309
64. A. Voelcker	1885	B 1886	2 3 years Bullocks Hereford	54	97	1.79	Decort. cot- ton-cake 3 Maize meal 5 Hay chaff 10 Swedes 45	1.99	13.52	11.85	1.60	10.87	1 : 6.8	8.25 (8.70)	1247
65. A. Voelcker	1885	B 1886	2 3 years Bullocks Hereford	54	79	1.46	Decort. cot- ton-cake 3 Maize meal 5 Sweet silage 43.6	2.36	12.82	12.0	1.96	10.64	1 : 5.5	9.9 (10.4)	1204

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							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of rest of digest. matter.				
16. A. Voelcker	1885	B 1886	2 3 years Bullocks Hereford	82	111	1.35	Decort. cot- ton-cake 3 Maize meal 5 Straw chaff 9.6 Swedes 45	1.63	13.08	11.20	1.31	10.50	1: 8.0	10.3 (10.9)	1247	
17. A. Voelcker	1885	B 1886	2 3 years Bullocks Hereford	82	160	1.95	Decort. cot- ton-cake 3 Maize meal 5 Oat silage 52	1.84	10.71	9.25	1.42	8.30	1: 5.9	6.15 (6.4)	1292	
18. A. Voelcker	1885	B 1886	2 3 years Bullocks Hereford	28	39	1.39	Decort. cot- ton-cake 3 Maize meal 5 Straw chaff 8 Swedes 45	1.62	12.41	10.1	1.23	9.46	1: 7.7	9.6 (10.1)	1316	
19. A. Voelcker	1885	B 1886	2 3 years Bullocks Hereford	28	66.5	2.38	Decort. cot- ton-cake 3 Maize meal 5 Oat silage 41	1.77	9.53	7.8	1.39	7.47	1: 5.4	4.5 (4.8)	1277	
20. A. Voelcker	1885	B 1886	4 3 years Bullocks Hereford	42	38	0.90	Decort. cot- ton-cake 3 Maize meal 5 Hay 19.5	2.27	14.13	11.6	1.69	10.57	1: 6.2	17.2 (18.2)	1337	
21. A. Voelcker	1885	B 1886	4 3 years Bullocks Hereford	42	53	1.35	Decort. cot- ton-cake 3 Maize meal 5 Oat silage 49	1.82	10.49	8.5	1.33	7.66	1: 5.8	9.2 (9.2)	1367	

72. A. Voelcker	1887	B	1887	4 4 years Bullocks Welsh	80	104.5	1.31	Decort. cot- ton-cake 3 Maize meal 3 Hay 22	2.26	12.64	12.2	1.94	10.83	1: 5.6	10.9 (11.4)	1165
73. A. Voelcker	1887	B	1887	4 4 years Bullocks Welsh	80	128	1.60	Decort. cot- ton-cake 3 Maize meal 3 Grass silage 67	2.13	11.05	10.7	1.79	9.40	1: 5.2	7.9 (8.2)	1176
74. A. Voelcker	1887-8	B	1888	4 3 years Bullocks Hereford	112	297.25	2.63	Linseed-cake 3 Decort. cot- ton-cake 3 Maize meal 3 Straw chaff 42 Hay 6.85 Swedes 39.9	2.45	12.42	11.0	1.92	9.80	1: 5.1	5.3 (5.7)	1274
75. A. Voelcker	1887-8	B	1888	4 3 years Bullocks Hereford	112	263	2.35	Bean meal 3 Oats 3 Barley 3 Straw chaff 4.1 Hay 6.9 Swedes 39.5	1.58	12.20	10.7	1.25	9.66	1: 7.7	5.8 (5.9)	1281
76. A. Voelcker	1887-8	B	1888	4 3 years Bullocks Hereford	112	241	2.15	Wheat 3 Oats 3 Barley 3 Straw chaff 4 Hay 6.97 Swedes 39.9	1.27	12.88	11.2	1.03	10.40	1: 10.1	6.5 (6.6)	1285
77. E. W. Voelcker	1889-90	B	1890	6 3 years Bullocks Shorthorn	110	344	3.13	Decort. cot- ton-cake 4.33 Linseed-cake 4.33 Hay 13.73 Swedes 40.2	3.31	13.98	12.3	2.56	10.8	1: 4.25	5.2 (5.5)	1295
78. E. W. Voelcker	1889-90	B	1890	6 3 years Bullocks Shorthorn	110	280	2.54	Decort. cot- ton-cake 2.16 Linseed-cake 2.16 Hay 15.49 Swedes 44.3	2.11	12.96	11.4	1.67	10.25	1: 6.2	5.7 (5.9)	1284

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							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, and fibre.	Total digestible matter.	Total albuminoids.	Starch equivalent of rest of digest. matter.			
79. E. W. Voelcker	1889-90	B 1890	6 3 years Bullocks Shorthorn	110	149	1.35	Hay Swedes 48.4	0.90	12.19	10.8	0.76	10.30	1: 13.6	10.0 (9.7)	1185
80. J. A. Voelcker	1888-9	B 1891	4 3 years Bullocks Hereford	145	321	2.22	Decort. cot- ton-cake 3.3 Linseed-cake 2.88 Barley 4 Hay chaff 8.88 Swedes 40	2.86	12.48	11.6	2.29	10.00	1: 4.4	6.5 (7.3)	1248
81. J. A. Voelcker	1888-9	B 1891	4 3 years Bullocks Hereford	145	286	1.97	Undecort. cotton-cake 3.3 Linseed-cake 2.88 Hay chaff 8.88 Barley 4 Swedes 40.34	2.07	12.25	11.2	1.68	9.97	1: 5.9	7.0 (7.3)	1230
82. J. A. Voelcker	1890-1	B 1891	8 3 years Bullocks Shorthorn	123	294	2.39	Decort. cot- ton-cake 5.03 Linseed-cake 3 Barley 1 Hay chaff 16.2 Swedes 40.5	3.83	14.43	12.9	2.89	10.89	1: 3.8	7.2 (7.7)	1326
83. J. A. Voelcker	1890-1	B 1891	9 3 years Bullocks Shorthorn	123	229	1.86	Undecort. cotton-cake 5.07 Linseed-cake 3 Barley 1 Hay chaff 16.1 Swedes 39.2	2.50	14.13	12.4	1.93	10.90	1: 5.7	8.7 (9.0)	1292

84. J. A. Voelcker	1891-2	B 1892	6 No age stated Bullocks Hereford	107	215	2.00	Beans 2.73 Oats 2.73 Barley 2.73 Clover hay 13.94 chaff 46.13 Roots	2.26	13.37	11.8	1.76	10.40	1 : 5.9	7.5 (7.8)	1284
85. J. A. Voelcker	1891-2	B 1892	6 No age stated Bullocks Hereford	107	216.6	2.03	Linseed-cake 8.18 Clover hay 13.48 chaff 45.03 Roots	3.32	12.91	11.8	2.58	10.04	1 : 3.9	7.5 (8.0)	1285
86. J. A. Voelcker	1891-2	B 1892	4 No age given Bullocks Hereford	107	235	2.20	Earth nut- cake 2.73 Oats 2.73 Barley 2.73 Clover hay 14 chaff 45 Swedes	2.91	12.92	11.9	2.25	10.0	1 : 4.3	7.0 (7.2)	1294
87. J. A. Voelcker	1893-4	B 1895	4 No age given Bullocks Hereford	61	18	0.28	Decort. cot- ton-cake 3.77 Barley 3.77 Barley straw 11.17 Linseed-oil 0.71	2.09	10.17	9.75	1.91	9.3	1 : 4.75	36.1 (43.8)	1091
88. J. A. Voelcker	1893-4	B 1895	4 No age given Bullocks Hereford	61	126	2.07	Decort. cot- ton-cake 3.77 Barley 3.77 Barley straw 12.01 Roots 41.08	2.18	12.94	12.2	1.90	10.76	1 : 5.7	6.75 (7.0)	1147
89. J. A. Voelcker	1893-4	B 1895	2 No age given Bullocks Hereford	80	151	1.89	Decort. cot- ton-cake 5 Barley 5 Barley straw 10.53 Roots 45.68	2.83	13.43	12.4	2.28	10.84	1 : 4.75	8.1 (8.6)	1239
90. J. A. Voelcker	1893-4	B 1895	2 No age given Bullocks Hereford	80	103	1.28	Decort. cot- ton-cake 3 Barley 2 Linseed-cake 5 Barley straw 14.1	2.81	11.16	10.5	2.33	9.17	1 : 3.96	9.9 (10.9)	1217

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91. J. A. Voelcker	1894-5	B 1896	3 Rising 3 years Bullocks Hereford	94	171	1.82	Linseed-cake 4.34	3.18	10.52	10.6	2.71	8.80	1: 3.3	6.86 (7.4)	1174
							Decort. cot- ton-cake 4.34								
							Hay chaff 2.33								
							Barley straw chaff 6.4								
92. J. A. Voelcker	1894-5	B 1896	3 Rising 3 years Bullocks Hereford	94	174	1.85	Roots 31.2								
							Linseed-cake 1.8	1.88	11.04	10.8	1.63	9.58	1: 5.9	6.72 (7.0)	1151
							Decort. cot- ton-cake 1.8								
							Wheat 2.55								
93. J. A. Voelcker	1894-5	B 1896	3 Rising 3 years Bullocks Hereford	122	198	1.62	Barley 2.55								
							Hay chaff 2.33								
							Straw chaff 6.41								
							Roots 31.22								
94. J. A. Voelcker	1894-5	B 1896	3 Rising 3 years Bullocks Hereford	122	220	1.80	Linseed-cake 4.66	3.43	10.78	11.5	3.02	9.49	1: 3.2	8.1 (8.8)	1137
							Decort. cot- ton-cake 4.66								
							Hay chaff 2.86								
							Barley straw chaff 6.1								
94. J. A. Voelcker	1894-5	B 1896	3 Rising 3 years Bullocks Hereford	122	220	1.80	Roots 32.1								
							Linseed-cake 2	2.09	11.74	11.3	1.77	9.96	1: 5.6	7.3 (7.7)	1178
							Decort. cot- ton-cake 2								
							Wheat 2.89								

95. J. A. Voelcker	1895-6	B	1896	8 2 years Bullocks Hereford	112	186	1.65	Linseed-cake 2.91 Decort. cot- ton-cake 4 Barley 2.06 Oat straw 3 Hay chaff 11.3 Roots 33.3	2.97	13.87	13.5	2.75	12.85	1 : 4.7	9.56 (10.2)	1179
96. J. A. Voelcker	1895-6	B	1896	8 2 years Bullocks Hereford	112	196	1.75	Linseed-cake 2.91 Decort. cot- ton-cake 4 Barley 2.06 Oat straw 2.62 Hay chaff 10.44 Roots 48.6	2.96	14.62	14.0	2.74	13.54	1 : 5.0	9.50 (10.0)	1188
97. J. A. Voelcker	1896-7	B	1898	6 Rising 3 years Bullocks Shorthorn	115	235	2.04	Linseed-cake 2.7 Decort. cot- ton-cake 2.7 Barley 2.7 Hay 9.7 Oat straw 2.6 Wheat straw 0.9 Clover hay 0.9 Swedes 56.6	2.71	15.15	12.85	2.06	11.56	1 : 5.6	8.25 (8.8)	1310
98. J. A. Voelcker	1896-7	B	1898	8 Rising 3 years Bullocks Shorthorn	122	222	1.82	Linseed-cake 2.7 Decort. cot- ton-cake 2.7 Barley 2.7 Hay 10 Oat straw 8 Wheat straw 1 Clover hay 2 Swedes 34.6	2.72	14.17	12.05	2.09	10.88	1 : 5.2	8.66 (9.3)	1301

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							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of rest of digest. matter.				
99. J. A. Voelcker	1900-1	B 1901	4 Rising 3 years Bullocks Shorthorn	144	281	1.95	Linseed-cake 4.1	2.74	13.92	12.3	2.24	11.29	1: 5.1	7.85 (8.6)	1235	
							Decort. cot- ton-cake 2.5									
							Maize 2.1									
							Undecort. cotton-cake 0.5									
100. J. A. Voelcker	1900-1	B 1901	4 Rising 3 years Bullocks Shorthorn	137	229	1.67	Hay 5.9	2.70	13.94	12.6	2.22	11.49	1: 5.2	9.2 (10.0)	1212	
							Straw 7.6									
							Roots 34.9									
							Linseed-cake 4.05									
101. J. A. Voelcker	1900-1	B 1901	4 Rising 3 years Bullocks Shorthorn	123	226	1.84	Decort. cot- ton-cake 2.4	2.59	14.25	12.9	2.14	11.80	1: 5.5	8.5 (9.2)	1208	
							Maize 2.1									
							Undecort. cotton-cake 0.4									
							Hay 5.6									
							Straw 9.2									
							Spice 0.25									
							Roots 35									
							Linseed-cake 3.76									

102. J. A. Voelcker	1900-1	B	1901	4 Riding 3 years Bullocks Shorthorn	197	253	1.85	Linseed-cake 4.03 Decort. cot- ton-cake 2.46 Maize 2.16 Undecort. cotton-cake 0.5 Hay 6.25 Straw 8.31 Molasses 0.25 Roots 35	2.76	14.45	12.9	2.26	11.83	1:5.3	8.5 (9.3)	1921
103. J. A. Voelcker	1901-2	B	1902	4 (Boxes) Age not given Bullocks Blue-grey	106	159	1.50	Beans 4.37 Oats 3.36 Wheat 2.50 Hay 7.08 Straw 2.71 Swedes 3.98 Mangolds 29	1.91	12.44	11.2	1.56	10.18	1:6.5	9.2 (9.6)	1923
104. J. A. Voelcker	1901-2	B	1902	4 (Yards) Age not given Bullocks Blue-grey	91	176	1.94	Beans 4.25 Oats 3.24 Wheat 2.42 Hay 7.66 Straw 3.55 Swedes 4.62 Mangolds 27.8	1.90	12.83	10.3	1.38	9.35	1:6.7	7.3 (7.6)	1971
105. J. A. Voelcker	1901-2	B	1902	4 (Boxes) Age not given Bullocks Blue-grey	98	194	1.98	Linseed-cake 4.15 Decort. cot- ton-cake 3.16 Maize 2.33 Hay 6.55 Straw 2.92 Swedes 4.30 Mangolds 28.1	3.08	12.19	11.4	2.48	9.84	1:4.0	7.1 (7.7)	1939
106. J. A. Voelcker	1901-2	B	1902	4 (Yards) Age not given Bullocks Blue-grey	84	200	2.38	Linseed-cake 4.24 Decort. cot- ton-cake 3.18 Maize 2.34 Hay 7.03 Straw 3.82 Swedes 5 Mangolds 27.2	3.16	12.80	10.6	2.28	9.25	1:4.0	6.2 (6.7)	1981

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							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible albuminoids.	Starch equivalent of food.	Total digestible matter.				
107. T. B. Wood .	1895-6	C Vol. VI.	5 3 years Bullocks Irish	78	135	1.73	Linseed-cake 2.2 Common cot- ton-cake 2.2 Crushed wheat 2.2 Crushed barley 2.2 Hay chaff 8 Straw chaff 8 Roots 42	1.62	14.15	12.5	1.22	10.68	1 : 8.7	9.6 (9.1)	1923	
108. T. B. Wood .	1895-6	C Vol. VI.	5 3 years Bullocks Irish	78	149	1.91	Linseed-cake, &c., as above Hay chaff 5.5 Straw chaff 5.5 Roots 84	1.61	16.66	13.5	1.21	12.53	1 : 10.3	9.4 (9.6)	1929	
109. T. B. Wood .	1895-6	C Vol. VI.	5 3 years Bullocks Irish	78	152	1.95	Linseed-cake, &c., as above Hay chaff 5 Straw chaff 5 Roots 107	1.62	18.32	14.7	1.22	13.76	1 : 11.3	10.0 (10.2)	1931	
110. T. B. Wood .	1895-6	C Vol. VI.	5 3 years Bullocks Irish	78	165	2.11	Cake, &c., and chaff as above 115 Roots	1.64	18.92	15.2	1.23	14.20	1 : 11.5	9.6 (9.7)	1934	
111. T. B. Wood .	1896-7	C Vol. VI.	4 2 years Bullocks Irish	133	280	2.10	Linseed-cake 8.7 Hay & straw chaff 8 Roots 112	3.16	16.92	16.3	2.70	14.48	1 : 5.4	9.0 (9.6)	1170	

112. T. B. Wood .	1894-7	C Vol. VI.	4 2 years Bullocks Irish	133	225.5	1.69	Linseed-cake 4.35 Common cot- ton-cake 4.35 Hay & straw chaff 8 Roots 112	2.47	16.43	16.0	2.17	14.45	1 : 6.7	10.9 (11.2)	1138
113. T. B. Wood .	1896-7	C Vol. VI.	4 2 years Bullocks Irish	183	231	1.73	Decort cot- ton-cake 4.35 Maize meal 4.35 Hay & straw chaff 8 Roots 112	2.48	17.70	16.8	2.14	15.27	1 : 7.2	11.1 (11.7)	1160
114. T. B. Wood .	1897-8	C Vol. VI.	5 2 years Bullocks Irish	118	202.4	1.71	Linseed-cake 8.6 Hay & straw chaff 8 Roots 112	2.96	17.34	15.9	2.45	14.40	1 : 5.8	11.2 (11.8)	1206
115. T. B. Wood .	1897-8	C Vol. VI.	5 2 years Bullocks Irish	118	180	1.52	Linseed-cake 4.3 Common cot- ton-cake 4.3 Hay & straw chaff 8 Roots 112	2.32	17.80	15.3	1.94	14.90	1 : 7.7	12.0 (13.2)	1194
116. T. B. Wood .	1897-8	C Vol. VI.	5 2 years Bullocks Irish	118	157	1.33	Decort cot- ton-cake 4.3 Dried grains 4.3 Hay & straw chaff 8 Roots 112	2.68	16.65	15.6	2.26	14.08	1 : 6.2	13.7 (14.5)	1183
117. T. B. Wood .	1898-9	C Vol. VI.	5 18 months Bullocks Red Poll	153	296	1.93	Linseed-cake 8.85 Hay & straw chaff 8 Roots 105	3.02	16.92	17.6	2.84	15.92	1 : 5.6	9.7 (10.3)	1062
118. T. B. Wood .	1898-9	C Vol. VI.	5 18 months Bullocks Red Poll	153	277	1.81	Linseed-cake 4.42 Common cot- ton-cake 4.42 Chaff 8 Roots 105	2.36	16.22	17.1	2.28	15.70	1 : 6.9	9.8 (10.2)	1084

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1119. T. B. Wood .	1898-9	C Vol. VI.	5 18 months Bullocks Red Poll	153	264	1.72	Decort. cot- ton-cake 4.42 Dried grains 4.42 Chaff 8 Roots 105	2.74	16.15	17.5	2.66	15.70	1 : 5.9	10.4 (11.0)		1028
120. T. Winter . .	1898-9	D 1898	4 2½ years Bullocks Welsh	66	126	1.92	Decort. cot- ton-cake 3 Maize meal 3 Hay & straw chaff 16 Long hay 5 Swedes 48	1.78	16.85	15.1	1.51	14.82	1 : 9.5	9.4 (9.7)		1175
121. T. Winter . .	1898-9	D 1898	4 2½ years Bullocks Welsh	66	108	1.64	Decort. cot- ton-cake 5 Maize meal 5 Hay & straw chaff 16 Long hay 4 Swedes 48	2.40	18.90	16.9	2.02	15.95	1 : 7.9	11.2 (13.0)		1184
122. T. Winter .	1900	D 1899	4 2½ years Bullocks Welsh	42	79	1.87	Decort. cot- ton-cake 4 Linseed-cake 2 Barley meal 4 Straw chaff 16 Long hay 5 Swedes 65	2.32	20.29	18.8	2.01	17.57	1 : 8.7	11.5 (12.1)		1155

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							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, mides, and fibre.	Total digestible albuminoids.	Total digestible albuminoids.	Starch equivalent of food or digest. matter.	Albuminoid ratio of food.			
180. T. Winter . .	1901	D 1901	3 No age given Bullocks Welsh	77	125	1.62	Cotton-seed meal 4.39 Maize meal 4.39 Hay & straw chaff 10 Long hay 5 Swedes 70	1.61	18.62	15.8	1.35	15.60	1: 11.6	11.6 (12.5)		1185
181. T. Winter . .	1901	D 1901	3 No age given Bullocks Welsh	77	173	2.24	Decort. cot- ton-cake 4.39 Maize meal 4.39 Hay & straw chaff 10 Long hay 5 Swedes 70	2.48	17.18	15.6	2.04	14.13	1: 7.0	8.5 (8.8)		1214
182. J. Hendrick .	1902	F 1902	10 Yearling Heifers Cross-bred Black	89	128	1.44	Linseed-cake 2 Oats 2 Oat straw 8 Swedes 110	1.01	14.40	16.6	1.10	15.76	1: 14.2	10.5 (10.7)		913
183. J. Hendrick .	1902	F 1902	9 Yearling Heifers Cross-bred Black	89	163	1.83	Decort. cot- ton-cake 1.33 Maize meal 1.33 Dried grains 1.33 Maize meal 2.94 Dried grains 2.94 Treacle 0.5 Oat straw 8 Swedes 55	1.73	13.75	16.3	1.89	15.05	1: 8.0	8.15 (8.60)		914

184. T. Winter . . .	1902	D XI.	5 No age given Heifers Welsh (f)	70	158	2.26	Decort. cot- ton-cake 3 Maize meal 3 Chaffed oat straw 10 Chaffed hay 5 Swedes 50	1.70	13.53	17.0	1.95	15.50	1 : 7.9	6.6 (6.8)	870
185. T. Winter . . .	1902	D XI.	5 No age given Heifers Welsh (f)	70	150	2.14	Decort. cot- ton-cake 3 Wheat meal 3 Chaffed oat straw 10 Chaffed hay 5 Swedes 50	1.83	13.08	16.4	2.08	14.86	1 : 7.2	6.8 (7.0)	881
186. T. Winter . . .	1902	D VIII.	4 No age given Bullocks Cross-bred	70	144	2.06	Buffalo grain feed Chaffed oat straw 14 Chaffed hay 7 Swedes 63	2.34	17.99	16.7	1.94	14.90	1 : 7.7	9.8 (9.9)	1200
187. T. Winter . . .	1902	D VIII.	4 No age given Bullocks Cross-bred	70	182	2.60	Decort. cot- ton-cake 4 Barley meal 4 Chaffed oat straw 14 Chaffed hay 7 Swedes 63	2.44	17.57	15.9	2.0	14.35	1 : 7.2	7.5 (7.7)	1222
188. T. Winter . . .	1903	D VI.	5 8 years Bullocks Welsh	50	118	2.38	Decort. cot- ton-cake 2.52 Linseed-cake 1.48 Straw 10 Hay 14.5 Swedes 100	2.21	20.29	15.8	1.58	14.45	1 : 9.2	9.4 (9.5)	1401
189. T. Winter . . .	1903	D VI.	5 3 years Bullocks Welsh	50	127	2.54	Decort. cot- ton-cake 3.78 Linseed-cake 2.22 Straw 9 Hay 12 Swedes 92	2.76	19.0	14.8	1.95	13.43	1 : 6.9	8.25 (8.60)	1413

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140. T. H. Middleton	1901	G 1902	8 Average age 55 weeks 5 Bulls 3 Heifers Shorthorn and crosses	84	145	1.73	Linseed-cake 3.24 Decort. cot- ton-cake 0.33 Maize 1 Oats 0.66 Wheat 0.33 Clover hay 3 Meadow hay 4.7 Swedes 58 Treacle 0.12	1.46	11.37	15.4	1.82	14.15	1: 7.8	7.15 (7.4)	802
							Linseed-cake 3.24 Decort. cot- ton-cake 0.33 Maize 1.5 Oats 0.66 Wheat 0.33 Clover hay 5.7 Meadow hay 4.7 Swedes 28 Treacle 0.62	1.60	10.78	14.8	2.0	13.49	1: 6.7	7.0 (7.3)	
141. T. H. Middleton	1901	G 1902	8 Average age 55 weeks 6 Bulls 2 Heifers Shorthorn and crosses	84	142	1.69	Linseed-cake 3 Maize meal 1.52 Oats 0.5 Barley 0.5 Clover hay 11.88 Treacle 0.5 Swedes 28	1.51	10.81	15.6	1.99	14.24	1: 7.2	5.9 (6.2)	760
							Linseed-cake 3 Maize meal 1.52 Oats 0.5 Barley 0.5 Clover hay 11.88 Treacle 0.5 Swedes 28	1.51	10.81	15.6	1.99	14.24	1: 7.2	5.9 (6.2)	
142. T. H. Middleton	1902-3	G 1903	8 Average age 43.5 weeks 7 Bulls 1 Heifer Shorthorn and crosses	165	332	2.05	Linseed-cake 3 Maize meal 1.52 Oats 0.5 Barley 0.5 Clover hay 11.88 Treacle 0.5 Swedes 28	1.51	10.81	15.6	1.99	14.24	1: 7.2	5.9 (6.2)	760

143. T. H. Middleton	1902-3	G 1903	8 Average age 42 weeks 5 Bullocks 3 Heifers Shorthorn and crosses	165	306	1.85	Linseed-cake 3 Maize meal 2 Oats 0.5 Barley 0.5 Clover hay 14.63 Treacle 0.75	1.64	10.13	14.9	2.19	13.51	1 : 6.2	6.0 (6.4)	749
144. T. H. Middleton	1902-3	H 1903	4 No age given Heifers Cross Shorthorn	111	246.75	2.21	Gluten feed 5.36 Clover hay 2.88 Meadow hay 4.56 Straw chaff 1.57 Mangolds 73	1.71	13.69	17.0	1.90	15.20	1 : 8.0	6.9 (7.0)	900
145. T. H. Middleton	1902-3	H 1903	4 No age given Heifers Cross Shorthorn	111	288.5	2.42	Decort. cot- ton-cake 1.78 Bruised wheat 3.58 Clover hay 2.88 Meadow hay 4.56 Straw chaff 1.57 Mangolds 73	1.54	13.71	17.2	1.75	15.60	1 : 8.9	6.2 (6.3)	878
146. R. S. Seton	1901-2	I 47, 1904	5 No age given Bullocks Cross Shorthorn Irish	112	215	1.92	Linseed-cake 1.375 Decort. cot- ton-cake 2.375 Dried grains 2.375 Maize 4.375 Hay 7 Oat straw 7 Swedes 70	2.32	18.05	14.7	1.69	13.70	1 : 7.8	10.0 (10.6)	1315
147. R. S. Seton	1901-2	I 47, 1904	5 No age given Bullocks Cross Shorthorn Irish	112	197	1.76	Linseed-cake 1.375 Decort. cot- ton-cake 2.375 Dried grains 2.375 Maize 4.375 Treacle 2 Hay 7 Oat straw 7	2.38	13.42	11.2	1.81	10.20	1 : 5.7	8.4 (9.0)	1315

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.			Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of rest of digest. matter.			
148. R. S. Seton	1901-2	I 47, 1904	5 No age given Bullocks Cross Shorthorn Irish	112	153	1.37	Linseed-cake 1.375 Decort. cot- ton-cake 2.375 Dried grains 2.375 Wheat 3.375 Treacle 2 Hay 7 Oat straw 7	2.37	12.51	11.0	1.87	9.90	1 : 5.3	10.2 (10.8)	1286
149. R. S. Seton	1902-3	I 47, 1904	4 No age given Bullocks Cross Shorthorn Irish	107	172	1.60	Gluten feed 4.7 Linseed-cake 4.7 Oat straw 11 Hay 5.5 Treacle 0.43 Turnips 56	2.55	16.75	14.1	1.93	12.70	1 : 6.6	11.5 (12.0)	1318
150. R. S. Seton	1902-3	I 47, 1904	5 No age given Bullocks Cross Shorthorn Irish	107	191	1.78	Common cot- ton-cake 2.35 Barley meal 2.35 Linseed-cake 4.7 Oat straw 11 Hay 5.5 Treacle 0.43 Turnips 56	2.02	16.43	13.3	1.53	12.40	1 : 8.1	9.9 (10.4)	1322
151. R. S. Seton	1902-3	I 47, 1904	5 No age given Bullocks Cross Shorthorn Irish	107	135	1.26	Common cot- ton-cake 2.35 Barley meal 2.35 Linseed-cake 4.7 Oat straw 11 Hay 5.5 Treacle 2	1.99	12.88	10.8	1.54	9.98	1 : 6.5	11.1 (11.8)	1291

# CATTLE-FEEDING EXPERIMENTS IN BRITAIN.

152. R. S. Seton .	1903-4	I 47, 1904	6 No age given Bullocks Cross Shorthorn Irish	84	194	2.31	Linseed- cake 4.75 Common cotton- cake 4.75 Maize 3.5 meal 3.5 Oat straw 9.5 Hay 5 Turnips 82	2.49	19.47	16.0	1.90	14.80	1 : 7.8	9.1 (9.5)	1314
153. R. S. Seton .	1903-4	I 47, 1904	6 No age given Bullocks Cross Shorthorn Irish	84	126	1.50	Linseed- cake 4.75 Common cotton- cake 4.75 Maize 3.5 meal 3.5 Oat straw 9.5 Hay 5 Treacle 2.92	2.47	14.46	12.4	1.94	11.35	1 : 5.9	10.6 (11.3)	1276
154. R. S. Seton .	1903-4	I 47, 1904	4 No age given Bullocks Cross Shorthorn Irish	84	138	1.64	Exactly as Lot A; roots were <i>pulped</i>	2.49	19.47	16.0	1.90	14.80	1 : 7.8	12.8 (13.4)	1308
155. R. S. Seton .	1903-4	I 47, 1904	4 No age given Bullocks Cross Shorthorn Irish	84	174	2.07	Same as above, but roots <i>sliced</i>	2.49	19.47	16.0	1.90	14.80	1 : 7.8	10.1 (10.6)	1313
156. C. B. Jones .	1907-8	J 1908	4 2 years Bullocks Welsh Black	112	154	1.37	Common cot- ton-cake 3 Barley meal 3 Chafed straw 5 Hay 10 Roots 50	1.20	13.44	14.5	1.20	13.41	1 : 11.2	10.5 (10.7)	1004

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.			Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of test or digest. matter.			
157. C. B. Jones .	1907-8	J 1908	4 2 years Bullocks Welsh Black	112	148	1.32	Common cot- ton-cake 5 Barley meal 5 Chaffed straw 5 Hay 10 Roots 50	1.64	15.47	17.1	1.72	16.25	1: 9.5	12.7 (12.9)	951
158. C. B. Jones .	1907-8	J 1908	3 Yearling Bullocks Shorthorn	84	150	1.79	Common cot- ton-cake 3 Barley meal 3 Chaffed straw 5 Hay 10 Roots 50	1.20	13.44	16.2	1.33	14.96	1: 11.2	8.1 (8.2)	898
159. C. B. Jones .	1907-8	J 1908	3 Yearling Bullocks Shorthorn	84	151	1.80	Common cot- ton-cake 5 Barley meal 5 Chaffed straw 5 Hay 10 Roots 50	1.64	15.47	19.8	1.93	18.25	1: 9.5	9.3 (9.5)	847.5
160. D. A. Gilchrist	1904-5	G 12, 1908	4 6 months { 3 Bullocks { 1 Heifer { 2 Shorthorns { 2 Blue-grey	140	290	2.07	Decort. cot- ton-cake 3 Maize meal 1.5 Meadow hay 8.5 Swedes 26.5	1.88	8.12	13.8	2.71	11.72	1: 4.3	4.7 (5.4)	693
161. D. A. Gilchrist	1904-5	G 12, 1908	4 6 months { 3 Bullocks { 1 Heifer { 2 Shorthorns { 2 Blue-grey	140	212	1.51	Earth - nut cake 3 Maize meal 1.5 Meadow hay 8.5 Swedes 26.5	1.76	8.42	14.2	2.59	12.38	1: 4.8	6.4 (6.7)	679

162. D. A. Gilchrist	1904-5	G 12, 1908	4 6 months { 3 Bullocks { 1 Heifer { 2 Shorthorns { 2 Blue-grey	140	234	1.67	Sesame cake 3 Maize meal 1.5 Meadow hay 8.5 Swedes 26.5	1.44	8.72	14.1	2.14	12.95	1: 6.1	5.7 (6.1)	673
163. D. A. Gilchrist	1904-5	G 12, 1908	4 6 months { 3 Bullocks { 1 Heifer { 2 Shorthorns { 2 Blue-grey	140	239	1.71	Niger cake 3 Maize meal 1.5 Meadow hay 8.5 Swedes 26.5	1.43	8.43	13.9	2.17	12.30	1: 5.7	5.6 (5.6)	683
164. D. A. Gilchrist	1905-6	G 12, 1908	5 18 months { 4 Bullocks { 1 Heifer { 4 Shorthorns { 1 Blue-grey	84	163	1.94	Decort. cot- ton-cake 3 Maize meal 3 Meadow hay 12.5 Swedes 42	1.94	12.82	16.7	2.30	15.2	1: 6.6	7.3 (7.6)	844
165. D. A. Gilchrist	1905-6	G 12, 1908	5 18 months { 4 Bullocks { 1 Heifer { 4 Shorthorns { 1 Blue-grey	84	157	1.87	Indian cot- ton-cake 3 Decort. cot- ton-cake 1 Maize meal 3 Meadow hay 12.5 Swedes 42	1.63	12.89	16.7	1.94	15.30	1: 7.9	7.5 (7.8)	839
166. D. A. Gilchrist	1905-6	G 12, 1908	5 18 months { 4 Bullocks { 1 Heifer { 4 Shorthorns { 1 Blue-grey	84	152	1.81	Indian cot- ton-cake 3 Linseed-cake 1 Maize meal 3 Meadow hay 12.5 Swedes 42	1.53	12.96	16.8	1.84	15.60	1: 8.5	7.7 (8.0)	832
167. D. A. Gilchrist	1905-6	G 12, 1908	5 18 months { 4 Bullocks { 1 Heifer { 4 Shorthorns { 1 Blue-grey	84	157	1.87	Linseed-cake 3 Maize meal 3 Meadow hay 12.5 Swedes 42	1.64	13.09	16.8	1.95	15.60	1: 8.0	7.5 (7.9)	839

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.				Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of rest of digest. matter.				
D. A. Gilchrist	1906-7	G 12, 1908	9 6 months Both sexes Blue- greys	112	105	0.94	Indian cot- ton-cake 1 Maize meal 0.5 Meadow hay 9.5 Swedes 28	0.60	7.38	15.0	1.14	14.02	1:12.3	8.4 (8.5)	526	
D. A. Gilchrist	1906-7	G 12, 1908	9 6 months Both sexes Blue- greys	112	96	0.86	Decort. cot- ton-cake 0.5 Linseed-cake 0.25 Maize meal 0.5 Meadow hay 9.5 Swedes 28	0.73	7.35	15.4	1.42	14.30	1:10.0	9.3 (9.4)	513	
70. D. A. Gilchrist	1906-7	G 12, 1908	6 18 months 4 Bullocks 2 Heifers Blue- greys	140	243	1.73	Indian cot- ton-cake 3.05 Maize meal 1.53 Hay 13.8 Swedes 56	1.15	13.24	16.0	1.30	15.0	1:11.5	8.2 (8.3)	885	
D. A. Gilchrist	1906-7	G 12, 1908	6 18 months 4 Bullocks 2 Heifers Blue- greys	140	255	1.82	Decort. cot- ton-cake 1.53 Linseed-cake 0.76 Maize meal 1.53 Hay 13.8 Swedes 56	1.54	13.11	16.3	1.76	14.96	1:8.5	7.8 (8.0)	877	
D. A. Gilchrist	1907-8	G 12, 1908	9 6 months Both sexes Blue- greys	98	67	0.68	Indian cot- ton-cake 0.67 Decort. cot- ton-cake 0.33 Maize meal 0.33 Linseed-cake 0.17 Meadow hay 9 Swedes 21	0.67	6.55	13.5	1.28	12.50	1:9.8	10.3 (10.6)	524	

173. D. A. Gilchrist	1907-8	G 12, 1908	9 6 months Both sexes Blue-grey	98	58	0.69	Indian cot- ton-cake 0.67 Decort. cot- ton-cake 0.33 Maize meal 2.33 Linseed-cake 0.17 Meadow hay 10	0.81	6.79	13.9	1.55	12.95	1: 8.4	12.3 (12.9)	524
174. D. A. Gilchrist	1907-8	G 12, 1908	6 18 months 3 Bulls 3 Heifers Blue-grey	112	182	1.63	Indian cot- ton-cake 2 Decort. cot- ton-cake 1 Maize meal 1 Linseed-cake 0.5 Meadow hay 14 Swedes 56	1.45	13.27	15.1	1.53	14.0	1: 9.2	8.8 (9.1)	951
175. D. A. Gilchrist	1907-8	G 12, 1908	6 18 months 3 Bulls 3 Heifers Blue-grey	112	217	1.94	Indian cot- ton-cake 2 Decort. cot- ton-cake 1 Maize meal 3 Linseed-cake 0.5 Meadow hay 16 Swedes 28	1.64	13.61	15.1	1.69	14.03	1: 8.3	7.6 (7.9)	970
176. W. Bruce . .	1903-4	K 1904	6 2 years Bulls Irish	170	272	1.60	Compound cake 5.1 Linseed-cake 1.4 Swedes 115.5 Oat straw (assumed) 12	1.67	17.39	15.0	1.36	14.15	1: 10.4	11.5 (11.9)	1228
177. W. Bruce . .	1903-4	K 1904	6 2 years Bulls Irish	170	305	1.79	Bombay cot- ton-cake 6.12 Linseed-cake 1.4 Swedes 115.5 Oat straw (assumed) 12	1.49	17.17	13.8	1.21	13.90	1: 11.5	9.6 (10.4)	1232

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.				Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible fat, carbohydrates, and fibre.	Total digestible albuminoids.	Total digestible matter.	Total digestible albuminoids.	Starch equiva- lent of rest of digest. matter.			
178. W. Bruce . .	1903-4	K 1904	8 2 years Bullocks Irish	140	298	2.13	Cotton-cake 5.15 Linseed-cake 2.5 Rice meal 3.87 Distillery dreg 9.9 Potatoes 16.1 Turnips 69.8 Straw (assumed) 12	2.49	20.16	17.0	1.97	15.98		1 : 8.1	10.1 (10.6)	1262
179. W. Bruce . .	1903-4	K 1904	8 2 years Bullocks Irish	140	323	2.31	Cotton-cake 5.15 Linseed-cake 2.5 Rice meal 3.87 Distillery dreg 19.4 Turnips 87.6 Straw (assumed) 12	2.95	18.92	15.8	2.28	14.61		1 : 6.4	8.9 (9.5)	1294
180. W. Bruce . .	1904-5	K 1905	8 2 years Bullocks Irish	140	270.3	1.93	Decort. cot- ton-cake 3.73 Bombay cot- ton-cake 1.20 Linseed-cake 1.83 Straw (assumed) 12 Swedes 121.4	2.29	17.6	15.6	1.85	14.25		1 : 7.7	10.0 (10.3)	1234
181. W. Bruce . .	1904-5	K 1905	8 2 years Bullocks Irish	140	290.5	2.04	Egyptian cotton-cake 6.63 Linseed-cake 2.14 Straw (assumed) 12 Swedes 121.4	1.86	18.08	15.6	1.43	14.35		1 : 9.7	9.5 (9.7)	1253

182. W. Bruce . .	1904-5	K 1905	8 2 years Bullocks Irish	140	290.5	2.04	Bombay cot- ton-cake 6.63 Linseed-cake 2.14 Straw (assumed) 12 Swedes 121.4	1.66	18.06	15.7	1.33	14.50	1 : 10.9	9.4 (9.7)	1244
183. W. Bruce . .	1905-6	K 1906	8 2 years Bullocks Irish	150	266.5	1.78	Bombay cot- ton-cake 3 Linseed-cake 3 Straw 15 Turnips 90	1.59	15.89	14.5	1.35	13.50	1 : 10.0	9.6 (9.8)	1177
184. W. Bruce . .	1905-6	K 1906	8 2 years Bullocks Irish	148	259.6	1.75	Bombay cot- ton-cake 3 Linseed-cake 3 Straw 10 Turnips 126.5	1.59	17.0	15.6	1.36	14.50	1 : 10.7	10.4 (10.6)	1171
185. W. Bruce . .	1905-6	K 1906	8 2 years Bullocks Irish	138	279.3	2.02	Bombay cot- ton-cake 5.23 Linseed-cake 3.36 Straw 15 Turnips 90	1.98	17.0	15.5	1.68	14.35	1 : 8.6	9.1 (9.4)	1186
186. T.H. Middleton	1904	L 1906	4 3 years Bullocks Cross Shorthorn	84	200	2.38	Linseed-cake 4 Oats 1.35 Meadow hay 10 Mangolds (Long Red) 95	2.05	17.96	14.4	1.50	13.44	1 : 8.8	8.1 (8.5)	1339
187. T.H. Middleton	1904	L 1906	4 3 years Bullocks Cross Shorthorn	84	159	1.90	Linseed-cake 4 Oats 1.35 Meadow hay 10 Mangolds (Yellow Globe) 95	2.02	17.89	14.7	1.54	13.70	1 : 8.9	10.1 (10.5)	1308
188. T.H. Middleton	1904-5	L 1906	6 Yearling Bullocks Various breeds	168	312	1.85	Linseed-cake 3 Decort. cot- ton-cake 1.03 Meadow hay 8 Mangolds (Long Red) 46	1.66	11.89	18.6	2.41	17.20	1 : 7.2	6.9 (7.3)	688

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.			Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Starch equivalent of digestible carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Starch equivalent of rest of digest. matter.			
189. T. H. Middleton	1904-5	L 1906	6 Yearling Bullocks Various breeds	108	319	1.90	Linseed-cake 3 Decort. cot- ton-cake 1.03 Meadow hay 8 Mangolds (Yellow Globe) 46	1.67	10.70	16.8	2.41	15.42	1 : 6.4	6.1 (6.5)	693
190. T. H. Middleton	1904-5	L 1906	3 2 years Heifers Various breeds	84	164	1.96	Linseed-cake 3.6 Decort. cot- ton-cake 0.77 Meadow hay 7 Oat straw 5.77 Mangolds (Long Red) 50	1.72	13.11	17.3	2.22	16.15	1 : 7.6	7.2 (7.8)	811
191. T. H. Middleton	1904-5	L 1906	3 2 years Heifers Various breeds	84	164	1.96	Linseed-cake 3.6 Decort. cot- ton-cake 0.77 Meadow hay 7 Oat straw 5.77 Mangolds (Yellow Globe) 50	1.73	12.11	16.0	2.22	14.80	1 : 7.0	6.7 (7.1)	818
192. T. H. Middleton	1905-6	L 1906	4 Yearling Bullocks Shorthorn cross	130	218.75	1.68	Decort. cot- ton-cake 1.67 Linseed-cake 1.43 Undecort. cotton-cake 0.2 Oats & barley 0.2 Meadow hay 7.7 Mangolds (Long Red) 65	1.51	12.05	17.1	1.95	15.60	1 : 8.0	7.9 (8.1)	788.3

193. T. H. Middleton	1905-6	L 1906	4 Yearling Bullocks Shorthorn cross	130	228.25	1.76	Decort. cot- ton-cake 1.57 Linseed-cake 1.43 Undecort. cotton-cake 0.2 Oats and barley 0.2 Meadow hay 7.7 Mangolds (Golden Tankard) 65	1.54	12.36	16.9	1.91	15.35	1 : 8.0	7.7 (7.9)	803.6
194. T. H. Middleton	1905-6	L 1906	4 2 years Bullocks Shorthorn cross	112	154.75	1.38	Decort. cot- ton-cake 2.24 Linseed-cake 1 Oats and barley 0.25 Meadow hay 8.25 Oat straw 3.75 Mangolds (Long Red) 95.5	1.80	16.96	17.3	1.70	16.0	1 : 9.4	13.3 (13.6)	1059.8
195. T. H. Middleton	1905-6	L 1906	4 2 years Bullocks Shorthorn cross	112	167.5	1.49	Decort. cot- ton-cake 2.24 Linseed-cake 1 Oats and barley 0.25 Meadow hay 8.25 Oat straw 3.75 Mangolds (Golden Tankard) 95.5	1.85	17.41	17.9	1.76	16.55	1 : 9.4	12.6 (12.9)	1052.1
196. T. H. Middleton	1906	L 1906	6 Age not given Sex not given Aberdeen-Angus	117	189	1.61	Decort. cot- ton-cake 3 Oat straw 8.16 Mangolds (Medium Long Red) 112	1.57	15.29	15.6	1.49	14.48	1 : 9.7	10.2 (10.5)	1056.5

Experimenter.	Date.	Refer- ence.	No. of animals per lot. Age. Sex. Breed.	Dura- tion in days.	Total increase in lb. per head.	Increase in lb. per head per day.	PER HEAD PER DAY.			PER DAY PER 1000 LB. LIVE-WEIGHT.				Albuminoid ratio of food.	Digestible matter consumed per 1 lb. increase in live- weight.	Average weight in lb. per head.
							Average rations in lb.	Total digestible albuminoids.	Search equivalent of digestible fat, carbohydrates, amides, and fibre.	Total digestible matter.	Total digestible albuminoids.	Search equivalent of rest of digest. matter.				
197. T. H. Middleton	1906	L 1906	6 Age not given Sex not given Aberdeen-Angus	117	172.5	1.47	Decort. cot- ton-cake 3 Oat straw 8.16 Mangolds (Yellow Globe) 112	1.60	13.69	14.1	1.52	12.95	1 : 8.5	10.1 (10.4)		1054.7
198. T. H. Middleton	1907	L 1907	6 Age and sex not given Aberdeen-Angus	112	277	2.48	Decort. cot- ton-cake 3 Oat straw 8 Mangolds (Long Red) 108.75	1.30	13.58	13.5	1.21	12.60	1 : 10.4	5.9 (6.0)		1074.5
199. T. H. Middleton	1907	L 1907	6 Age and sex not given Aberdeen-Angus	112	211	1.89	Decort. cot- ton-cake 3 Oat straw 8 Mangolds (Yellow Globe) 108.75	1.31	11.18	11.5	1.24	10.6	1 : 8.5	6.5 (6.6)		1053.5
200. T. H. Middleton	1907	L 1907	8 Yearling Both sexes Crossbred	84	55	0.66	Linsed-cake 1 Oat and bar- ley chaff 3.8 Mangolds (Long Red) 48	0.32	6.21	11.4	0.57	11.09	1 : 19.4	9.8 (9.9)		561.4
201. T. H. Middleton	1907	L 1907	8 Yearling Both sexes Crossbred	84	52.2	0.62	Linsed-cake 1 Oat and bar- ley chaff 5.7 Mangolds (Yellow Globe) 48	0.34	6.31	11.6	0.60	11.20	1 : 18.5	10.5 (10.7)		564.5

## INFLUENCE OF TEMPERATURE ON MILK YIELD.

EXPERIMENTS IN THE PRODUCTION OF MILK IN WINTER  
UNDER FREE *VERSUS* RESTRICTED VENTILATION.

By JOHN SPEIR, Kt. St O., Newton.

WITHIN the last few years a spirit of doubt seems to have grown up in men's minds in these Northern parts where cold winters prevail, whether the benefit to be obtained from keeping farm animals in the comparatively high temperature aimed at in past years is really as great as is generally believed. The prevalence of tuberculosis among farm stock in most countries, and the success of the open-air treatment in arresting this disease among human beings, have probably had something to do with the consideration which this subject has received during recent years. Be that as it may, numerous experiments with various kinds of farm stock have recently been carried out, with the view of throwing light on the subject, in different parts of the world.

In most of these experiments the stock was divided into two lots, one essential difference being that the one lot were kept what was called warm, while the other were maintained in a cool or even cold temperature. Both lots, as a rule, were fed alike, or at least received the same kind of food, but were allowed to eat as much as they felt inclined of one or two classes of food. No heat was, as a rule, applied to the warm building, other than what was obtained from the expired air and the bodies of the animals. Indeed, in most of these experiments the conditions were supposed to be identical, with the exception that the one lot were kept in very much warmer air than the other.

But it has been generally omitted to take into consideration the fact, that where the heat was derived from the bodies of the animals the air was much polluted, and that the experiments, instead of being confined to one essential—viz., two degrees of temperature—were in reality influenced by two—viz., heat and fresh air,—and it was impossible to say which had exercised the greater influence on the result.

Most of the experimenters have, however, come to the conclusion that animals did not derive so much benefit from being kept what was called warm as was generally supposed, neither did they seem to suffer so much as was usually expected when kept cool or cold. From what has already been done, principally with feeding animals, it seems in the extremes of temperature

we are accustomed to in Britain, that everybody has put too high a value on heat, and too low a value on fresh air. The consequence has been that any benefits which might have been derived from the higher air temperature were nullified by the contaminated condition of the atmosphere, while the greater consumption of food which was expected in the lower temperature has not always been experienced, owing to the healthier condition and better digestion of the animals enjoying the fresh air. The latter disturbing element has upset most ordinary calculations, and has imported into the question an influence which has hitherto received very little consideration.

### *Trials in America.*

The following is a summary of a few of the experiments bearing on this question which have recently been carried out.

In the winters of 1902-3 and 1903-4 the Pennsylvania State College divided, each winter, 24 bullocks into two lots, one of which was fed in a byre under a barn, and the other in an open shed. Both lots were fed alike, and all food not eaten was taken out, re-weighed, and deducted from that originally given. Self-recording thermographs were kept in each building.

The experiment in the latter year began on 10th December, and was continued till 4th April. During that period the lot in the byre gained 230 lb. on an average, while those in the shed gained 227 lb. For the first two months the average temperature of the byre was 38·6 degrees F., while that of the shed was 14·5 degrees F. The animals in the byre consumed rather less food than those in the open, the value of the extra food used being equal to  $\frac{1}{3}$ d. per lb. of live-weight increase.

In this experiment, although carried on for two winters, the number of animals employed was too limited to provide conclusive results, and the winter was too far advanced before the experiment began. Prior to beginning the experiment both lots of animals were kept in the byre from the time they were housed. That should not have been done; they should have been weighed and divided at the time they were taken from the pasture.

In drawing their conclusions from the two winters' work the experimenters say: "It would seem that whatever advantage is shown by the byre over the shed, as shelter for fattening steers, is not due to the higher temperature of the byre, but to some other condition of environment."

Somewhat similar conclusions have in recent years been arrived at with poultry in the production of eggs in winter in various parts of the country, all trials of the kind indicating

that the value of fresh air has been under-estimated. For the production of either meat or milk, pure air seems to be a factor of considerable importance, and although it may not have the same influence as food or breed, it should not by any means be disregarded.

### *Trials in England.*

In the autumns of 1901, 1902, 1903, and 1904 an interesting experiment having an important bearing on this question was carried out at the Harper Adams Agricultural College, Newport, Salop. In Shropshire the regular practice is to leave all cows in the field at night till the end of October, after which they are kept in the house at night and put out during the day. In each year two lots of 5 cows each were selected for experiment, the cows corresponding as nearly as possible as to date of calving, length of time in milk, and weight of animal. Both lots went in the same pasture during the day, but at night one lot were kept in the house after being milked, while the other was put out into the field, and remained there till milking time next morning. The lot of cows in the house at night received about 8 lb. of hay, while those outside received nothing but what pasture they might gather.

In the first three years the animals selected for the experiment were such as had calved in early summer, but in 1904 one or two late-calved cows were included.

In 1901 the experiment began on	Nov. 2	and continued till	Dec. 7.
In 1902	"	Nov. 22	" Dec. 13.
In 1903	"	Oct. 31	" Nov. 28.
In 1904	"	Nov. 5	" Dec. 31.

In each year the climatic conditions varied considerably during the progress of the experiment. In 1903 there were thirteen nights when the thermometer fell below the freezing-point, and for November the rainfall was 2.41 inches. In 1904 the rainfall was 1.09 inches for November, and on twelve nights the thermometer fell below the freezing-point, and on one of these there were 25 degrees of frost. The table on p. 258 gives the result of the experiment for each year.

### *Experience at Newton.*

In order to attain the best results at the minimum of cost in the production of milk in winter, the housing of cows has received very close study here for many years. Like the most of other milk producers, I was long under the erroneous impression that milk could not profitably be produced in our

# INFLUENCE OF TEMPERATURE ON MILK YIELD.

climate in winter unless the cows were kept warm, or say at from 60°F. to 63°F. Later experience led me to gradually doubt this, and during the winter of 1899 the temperature was somewhat reduced from that at which the cows had previously been kept, without any apparent depreciation in milk or injury to health. The results gave some confidence in the method pursued, and in the autumn of 1899 the byres here were kept freely ventilated and consequently cool. This was continued on throughout a winter which was not by any means mild, without any apparent shrinkage in the milk produced, injury to the health of the animals, or inconvenience of any kind. At

YEAR.	Length of the experiment in weeks.	Average yield per cow for a similar period previous to the experiment.		Average yield per cow during the experiment.		Decrease in milk per cow per week in lb.	Increase in the per cent of fat.	Increase in live-weight per head in lb.
		Milk in lb.	Per cent of fat.	Milk in lb.	Per cent of fat.			
1901.								
Cows out	5	640	3.78	624	4.55	3.2	.77	6.0
Cows in	5	677	3.51	619	3.84	11.6	.81	1.5
1902.								
Cows out	4	455	3.90	401	4.20	13.6	.30	10.9
Cows in	4	510	3.80	405	4.30	26.4	.40	2.8
1903.								
Cows out	5	629	3.63	662	4.10	23.0	.52	8.0 loss
Cows in	5	563	3.85	595	4.30	22.0	.49	8.0 loss
1904.	First							
Cows out	4	515	3.72	455	4.19	14.8	.47	7.2
Cows in	4	468	3.49	406	3.68	15.6	.19	3.4
1904.	Second							
Cows out	4	*711	3.10	655	3.15	7.0	.05	4.6
Cows in	4	*552	3.37	497	3.55	7.0	.18	1.5
Aug. {	4	590	3.63	559	4.04	31.0	.41	4.1
Cows in	4	554	3.61	504	3.93	50.0	.82	.24

\* The larger average yield is due to the exclusion of one cow from each lot, which was nearly dry.

the end of April 1900 a paper was read by me at the Conference on Tuberculosis convened in Glasgow: that paper contained the three following paragraphs, which fully explained the position then, and equally explains the position now, for since then very little progress has been made.

"Personally, I do not consider that it is necessary for the profitable production of milk in winter in this climate that cows must be kept at or over 60° F. It is well known that animals kept under cool or cold conditions gradually develop a covering of hair, which in great part protects them against sudden changes of weather. Cattle of all kinds in early autumn begin to assume a coat which gradually becomes longer and closer as the weather gets colder. Animals so protected are quite comfortable

in temperatures far below 60° F., and if shut up in a byre at that temperature they perspire so freely that their coats become quite wet; if kept warm, such animals speedily shed their hair, because Nature feels it is no longer necessary, and is only a burden to the animals.

"In byres which are freely ventilated in autumn the temperature will be kept moderately low, the stock will in consequence gradually assume a longer and more compact coat than they had in summer. This coat is what is so much desired by showyard judges; consequently most animals taking prizes at the shows presently being held have been kept in cool buildings. With such animals milk can be profitably produced in winter in freely-ventilated byres which during the cold time of the year will have a temperature of from 45° F. to 50° F. Neither will the milk shrink to any appreciable extent when very cold snaps come on, lowering it to 40° F. or even 35° F., as is so notoriously the case with cows kept in close warm byres. When turned out in spring, such animals do better than thin-haired ones, and as warm weather comes on they gradually shed their hair. The present method of keeping cows in winter is an inversion of Nature's method, as, housed as they are now, they have their lightest coats on in winter, and of course suffer severely if exposed to anything like adverse conditions of weather.

"During the past winter a friend and I, each having stocks of from sixty to seventy cows in milk, have given the system of keeping on the winter hair a fair trial, and after recently comparing notes, we are both satisfied that the method is on the proper lines. Both of us have had a very satisfactory production of milk during a winter which has not been above the average in temperature. In both cases the byres have been freely ventilated, the temperature being seldom at or over 50° F., yet weeds or chills have been below the average, while no extra precautions were taken other than to sheet all cows for several days after calving."

Since then all buildings here in which cows are kept have been systematically and freely ventilated, and although the byres at Newton have greater provision for ventilation and for the regulation of it than exists on many farms, the regulators are scarcely ever moved, remaining quite open, practically speaking, all winter. While I was quite satisfied that the results obtained by the freely ventilating system were in all respects satisfactory, there were many points on which I had no definite information, as no test of similar lots of cows had ever been attempted. From the quantity of milk produced each winter compared with the time when the cows were kept warmer, there could be little question that the quantity was not very different. It also seemed certain that the cows were

healthier, but the chances were that they might require more food to produce a given quantity of milk, than if they had less fresh air and been kept warmer. I had kept it in mind for several years, that as soon as a suitable opportunity occurred for doing so, two lots of cows would be put under test for this purpose, and with that end in view the Highland and Agricultural Society had their attention directed to the matter.

The keeping of cows so warm as has generally been the practice with producers of winter milk for the last thirty or forty years, seems to me to have grown with the public demand for fresh milk in winter. Prior to that date the majority of cows calved in spring, and during winter were out for a longer or shorter period every day. In cheese-making herds this practice is still followed, but where winter milk is produced in quantity the cows are seldom out from November to May. Farmers have apparently followed the methods in vogue among town cow-keepers, who half a century ago were the principal producers of winter milk; but their byres were not usually models from a sanitary point of view.

### *Origin of the Experiment.*

The Science Committee of the Highland and Agricultural Society, on the suggestion of the writer, took into consideration on various occasions during the autumn of 1907 the advisability of instituting one or more experiments with cattle, either cows in milk or feeding animals, or both, in which two similar lots of animals would be fed and housed alike; the building containing the one lot to be freely ventilated in all kinds of weather, so that its air, while relatively pure, would be comparatively cool or cold, and the other to have its ventilation so restricted that the temperature would be maintained at about what is met with in the open air during the summer months. Owing to the facility with which the milk of cows can be weighed and tested as to quality, and more especially in view of the fact that cows in full milk were presumed to be more sensitive to cold than fattening animals, it was ultimately decided that for the first winter the experiment should apply only to cows in milk.

On account of the want of uniformity in animals, and the necessity of guarding against irregularity, and the consequent upsetting of the results by the introduction into either lot of one or more exceptionally profitable or unprofitable animals, it was decided to attempt to get a moderate number of cows in various herds to participate in the experiment. It was expected,

if the numbers could be made sufficiently large, that the irregularities existing among the cows, in the housing or in the weather conditions, would so balance each other as to make the results fairly reliable, at least for a first attempt. To secure this, it was considered that the experiment should be carried out only at centres where a considerable volume of milk was produced in mid-winter, where the buildings were satisfactory, and where suitable provision could be made for weighing and testing the milk.

In order that all the details might be thoroughly controlled, it was deemed desirable that thermographs or self-recording thermometers should be placed in every building, and that in addition there should be a set of wet and dry bulb thermometers in each byre, the readings of which should be taken daily very early in the morning, again about one o'clock, and late at night. The difference between these readings gives one of the most accurate methods known for estimating the moisture in the air of the building, and from these it was expected that valuable information might be obtained. In addition it was hoped that rapid estimations of the carbon-dioxide in the air of the various byres might be made at frequent intervals; and at wider ones, say once a-month, that jars might be filled with the air of the byres and submitted to chemical analysis.

It was also thought desirable that samples of the air should be submitted to bacteriological examination, in order to see if anything could be learned from this branch of the inquiry regarding the various moulds and microbes which might be floating about in the air of the different byres.

It became evident that providing this large number of costly scientific instruments, the making of necessary structural alterations in byres, and carrying out the experiments would involve substantial expenditure, and the Society decided to invite the financial co-operation of the Board of Agriculture. This was readily granted, the Board agreeing to contribute about one-half of the cost.

On this basis the writer was instructed to make arrangements for having the experiment carried out at four or five suitable centres, and with such a number of cows as were available. Communication was opened with several private and public institutions which it was thought had the buildings suitable for carrying out such an experiment, and some of which it was expected would be willing to do so. Early in the spring of 1908 it was arranged that the following stocks would be placed at the disposal of the Committee in the autumn, and that in the interval arrangements would be made for erecting a suitable division across the byres where such was necessary, and

for providing persons and apparatus suitable for weighing and testing the milk:—

Crichton Royal Institution, Dumfries, one byre, each division of which would hold 8 cows.

Lanark District Asylum, Hartwood, two similar byres, with 8 cows each.

Glasgow Lunacy Board, Woodilee, two similar byres, with 10 cows each.

Newton Farm, Newton, one byre, each division of which would hold 18 cows.

Later on there was added to the list the Asylum Farm, Rosslynlee, Mid-Lothian, with one byre, each division of which would hold 6 cows.

This made a total of 100 cows, a number considered sufficient to give results that might be confidently looked on as reliable.

After the various centres had been arranged, a set of instructions for persons carrying out the experiment was prepared, and copies sent to each farm. The following is a copy of these instructions, which better than anything else explain the scope of the work:—

*Instructions for Persons carrying out the Experiment.*

In making preparations for this experiment, it is suggested that as large a proportion as possible of the cows subjected to it should be animals which have only recently calved, and which have not been shut up for any great length of time in a close warm byre. The cows should be kept in the fields during the day as late into autumn as the state of the weather will permit, and when they are in the byre at night the temperature should be kept low by allowing a free current of air to enter and go out by all ventilators and windows.

If the byre in which it is intended to carry out this experiment is not provided with an inlet ventilating opening of say 30 sq. inches (5' x 6"), it will scarcely be possible to keep the temperature low in mild weather. The roof ventilators should be greater in area than the inlet openings, and if it is intended to alter either, this should be carried out during summer.

The date at which the experiment should begin will vary with the situation of the farm and the season, as in some cases it will be necessary to keep the cows in the house all day at a much earlier date on some farms than on others. This will be regulated by the weather for the time being, and the altitude and exposure of the different farms; but it is unlikely that in any case it will be necessary to wholly confine the cows to the house before the middle of November.

Before that, a spring balance and can should be provided for weighing the milk of every cow at each milking. Where not already available, these may be obtained from the Dairy Supply Company, Grass-

market, Edinburgh. Late in October or early in November the milk of each cow should be weighed at every milking, and the total found for the week for each animal.

If not earlier done, about this date a temporary division should be erected across the byre so as to have two buildings identical in all respects, except that one is to remain freely ventilated, while the other is to be the reverse. The measure of the ventilation is to be the temperature of the building.

In order to get uniformity of conditions in buildings of various construction and exposure, it is desirable that the thermometers and hygrometers should all be placed in a somewhat similar position, and a hanging shelf or platform in the centre of each building, say from 6½ feet to 7 feet above the floor, is suggested as being the most likely to suit a wide variety of circumstances.

The freely ventilated building is to be kept at from 50° to 53° F., and not to exceed 55° F., while the other is to have the ventilation so restricted that, unless in frost, the temperature remains steady between 60° and 63° F., and does not exceed 65° F. During frost, or more especially with a combination of frost and heavy wind, both buildings may have lower temperatures than those stated above, but in ordinary seasons such periods do not usually last very long.

The division should be built of wood, with upright standards and cross bars where necessary, of spars 3 × 2 inches, and 18 inches or so between the uprights. On both sides of this framing roofing-felt of good quality should be nailed, short tacks being used where it is single, and longer ones where the edges overlap. Outside the tarred felt both sides should be covered with ½-inch tongued and grooved lining planed on one side, which should be nailed on across the uprights.

In order to permit of economically attending to the stock, it may be necessary to have one or more doors in the temporary division, but each should decide for himself how many of these are necessary, as the fewer there are the better. The doors need not be heavier than of ¾-inch flooring, and may be hung any way to suit.

The division should extend from the floor to the apex of the roof, and all round should be as well fitted as possible. It should be substantially erected, yet in such a way that at the termination of the experiment it can be removed without greatly damaging the materials. With the divisions carefully erected as suggested, little heat will pass from one building to the other.

After the milk of each cow has been weighed for ten days or so without any alteration being made in the ventilation, the cows should be as evenly divided as possible, so that not only will the daily yield of milk of each lot be almost identical, but the average date since calving should also closely correspond. For instance, if there were a dozen cows in each lot, there should, as far as possible, be the same number one month, two months, or three months calved. It will also be desirable to divide the different lots as nearly as possible according to age. For instance, where heifers calve in autumn, and they are included among the animals under experiment, an equal number should be put in each lot. To some extent the same will apply to

four-year-olds, but with older animals uniformity of milk yield will be of more importance than age.

When the number of animals in the herd permits of it, all odd cows, to place opposite which there is no corresponding animal, should be put into the ordinary herd. These should be kept in reserve, so that they may take the place of those in either of the experimental lots should anything go wrong with them. In the same way, if some cows have been utilised for the experimental lots which have been calved for several months, an equal number in each lot may be replaced by newly calved cows in the middle of winter, provided the newly calved cows have not previously been kept for any great length of time in a badly ventilated building. It will, however, be desirable to have the experiment carried out with as little change of animals as possible, yet, if done with care, such need not materially disturb the results.

Where provision exists for estimating the fat in the milk, a small sample, say  $\frac{1}{2}$  wine-glass or less, of that of every cow should be retained from each milking. For each cow there should be kept a stoppered bottle holding 8 oz. or so, into which a pinch of bichromate of potash has been put, which bottle should bear the same number as the cow the milk of which it is to hold. To prevent confusion, it would be well to have all the numbers in one lot under, say, 20, and all the numbers in the other lot over that number. As soon as the milk of each cow is weighed, it should be emptied into a spare bucket and a small sample at once drawn and put into the bottle. This composite sample of the milk of each cow may be tested once a-week on such day as is most convenient for the person in charge. The preservative will keep it fluid any reasonable length of time, and does not interfere with the testing, but when this is completed the sample should be thrown out, as the preservative is poisonous. This sample is to be known as the weekly composite sample of milk for each cow.

Besides the small sample of each cow which is put into the bottle, another sample is to be put into a spare bucket or jug. The quantity put in this vessel should be roughly in proportion to the total milk. Thus, for a cow giving 10 lb. at each milking one measure of the sampling dish might be used, while two should be taken where another cow gives 20 lb., and two and a half if 25 lb. are given at each milking. These samples from the milk of different cows are all mixed together in the one bucket, jug, or basin, and when the milking is finished the contents are emptied from one vessel to another two or three times, and a sample amounting to 1 or 2 oz. drawn and put into a small bottle bearing the date and marked to distinguish the set of cows to which it belongs. The remainder of this milk may be taken to the dairy and used in the ordinary way. This sample is to be known as the daily composite one for each herd. It acts as a check on that of each cow, and it is expected it may give valuable information during the period when variable weather is expected. Sufficient bottles should be provided for one week, to enable all testing to be done at the same time.

Where there is no provision for testing, a box and supply of bottles might be provided, and if these were sent to Newton periodically, the

contents would be tested and the bottles washed and returned without delay.

Sheets will be provided on which to enter the daily weight of milk and weekly per cent of fat, and after the experiment has begun the sheet for each week should be forwarded to Mr John Speir, Newton Farm, Newton, Glasgow, who will supervise the work and summarise the results as it proceeds.

Bottles, bottle-holders, preservative, sample-milk measurer, milk-record sheets, testing bottles, and materials for testing, can, where necessary, be obtained in whole or in part from the Dairy Supply Co., Grassmarket, Edinburgh.

It is desirable that the following scientific instruments be provided for *each* building (two for each farm) :—

A thermograph or self-recording thermometer, costing about £5, 5s.

A hygrometer or wet and dry bulb thermometer for estimating the moisture in the air, costing about 12s.

A Lunge and Zeckendorf or other apparatus for testing the carbonic acid in the air, costing about 15s.

A jar or two for taking samples of the air for chemical analysis at periodic intervals.

A Hesse apparatus for collecting the micro-organisms from the air prior to bacteriological examination, cost about £1, 16s. complete. Only one set of this apparatus need be provided for each farm.

The self-recording sheets from the thermograph should be sent each week to Mr Speir, along with the milk-record sheets.

The readings of the hygrometer or wet and dry bulb thermometers should be taken when the building is opened in the morning, as well as at or near the middle of the day, and about 9 o'clock in the evening, the same hours being so far as possible adhered to during the continuation of the experiment.

The air of the byre should be tested periodically for carbonic acid, say weekly or fortnightly, after the doors have been closed for an hour or longer at mid-day, and again in the evening after the doors have been closed for several hours, say at 9 P.M.

Sample jars of the air for chemical analysis should be taken every fortnight or month on the same date as the air is tested in the evening, and from the night air—these samples of air to be sent to the chemist to the Society, Mr James Hendrick, Marischal College, Aberdeen.

The micro-organisms and other germs may be collected by the Hesse apparatus once or twice a-month, each alternate occasion being at mid-day and the other in the evening—the tubes containing these organisms to be sent to Mr Hendrick.

Where this can be provided, it would be well that some person with a scientific training should take the full charge of the various scientific instruments: the dairymaid of the sampling, weighing, and testing of the milk; and the farm manager or byreman of the supervision of the cows.

*Arrangements for Weighing, Sampling, and Estimating the per cent of Fat in the Milk.*

At Newton, where the number of cows engaged in the experiment was very much larger than at any of the other farms, it was arranged early in the year that one person should devote his whole time to weighing and sampling the milk, estimating the fat, and weighing the food. This work was entrusted to Hans Petersen, a Danish farmer's son, who carried it out with the greatest care and the utmost accuracy. From Hartwood the milk was sent to Newton by rail at the end of each week and there tested. The testing of the milk was carried out at each of the other three centres by one of the staff.

At Newton two samples were taken of each cow's milk every night and morning. One of these was used for the estimation of the fat in the milk of each cow at each milking, while the other was kept as a composite sample of a small portion of the milk of every cow. There was thus data available from two sources for estimating the fat in the milk of every milking, as the sample composed of a small portion of the milk of each cow gave this information directly, while the average by calculation of the fat in the milk of each cow gave the same information indirectly. The one acted as an exceptionally reliable check on the other, and almost prevented the possibility of a mistake.

As showing the accuracy with which the sampling and estimation of the fat were done, it may be mentioned that the two methods were usually within .1 per cent of each other, and it was very rare for them to differ so much as .2 per cent.

Towards the end of the experiment, as the percentage of fat in the milk became greater, it was noticeable that there was a greater tendency for the gap between the two sets of figures to widen than was the case when the per cent of fat in the milk was less. There is no time when milk is so easily or so accurately sampled as just after it has been milked; and if the samples are drawn immediately the milk has been emptied from the milking-cog into the weighing-bucket, and before it is weighed, there is never any difficulty of drawing accurate samples. The weighing is not influenced by being delayed until the samples are drawn, while a very few seconds' delay in drawing the samples has a great tendency to render them inaccurate. The food was weighed once a-week, and from the weekly weights the average amount consumed per cow per day was calculated.

At Woodilee the weighing, sampling, and testing of the milk was in charge of Miss A. Morton, N.D.D., but as she had other duties to perform, being in charge of the poultry there, she could not spare time to estimate the fat in the milk of

each cow every night and morning. No estimations of the fat in the milk of individual cows each milking were ever made here, but two composite samples were taken of every milking—one of the milk of each cow for the week, and the other of the milk of all the cows of that lot for each milking.

At Crichton the weighing and sampling were done by the man in charge of the cows, while the fat was estimated by Dr Wallace, the assistant doctor at the Asylum. Here a composite sample of the milk of each cow was taken for each week, and from the daily composite sample of each lot a portion was retained which constituted the composite sample for that lot of cows for the same week. The weekly composite sample for each lot of cows rarely differed materially from the average of each by calculation, although there were more instances when the difference between the two was over .2 per cent of fat than occurred with the previous two farms.

At Hartwood the weighing and sampling of the milk were done by those in charge of the cows, but as no provision had been made for estimating the fat in the milk the samples were sent by rail to Newton at the end of each week, where, as already indicated, they were tested by Mr Petersen. The system of composite samples adopted here was much the same as at Woodilee, but instead of there being one of each lot of cows for each milking there was one for each day, besides the weekly one for each cow. The average of the daily samples compared very closely with that of the cows for the same week, thus showing very careful sampling.

At Rosslynlee I understand that the milk of each cow was tested for fat at every milking, but the figures sent me were those for the daily composite samples and for the weekly ones for each cow. The averages by the two methods did not differ materially, and indicated careful sampling. In this case the weighing and sampling were done by those in charge of the cows, while the estimations of fat were made by Dr Lauder, chemist to the East of Scotland Agricultural College, who has been doing so for this farm for several years.

### *Preliminary Trials.*

At Newton the milk of each cow was weighed and tested for fat daily for almost three weeks prior to dividing the cows into two lots. This gave a much better opportunity of dividing them evenly than if it had been done at the end of the first or second week. A temporary division was, in fact, made at the end of each week, but, owing to several of the more recently calved cows having improved in the interval, other changes had to be made. The larger number of cows employed here, and

the longer preliminary trial to which they were subjected than at some of the other farms, with the longer period which most of them had been calved, contributed materially to the uniform and steady results which were obtained from these cows.

A somewhat similar preliminary trial was made at Crichton, but at Woodilee and Hartwood it was confined to one week. With cows which have been calved from one to two months, their yield of milk is sufficiently developed to permit of a fairly accurate division after a preliminary trial of a week or ten days. With quite recently calved cows, such as most of those at Hartwood, a much longer preliminary trial than a week is necessary before anything approaching an accurate division can be made. In the A section of the Hartwood lot, in the first three months cows No. 1 and 8 increased from 50 to 60 per cent in their weight of milk compared with what it was in the first week, while the most of the others had only a slight increase or remained steady. In the B section almost every cow increased from 25 to 50 per cent in their weight of milk within the same period; but there is no indication that any of the increases of either section had anything to do with the conditions to which the cows were subjected.

The cows which were ultimately selected for the A section at Hartwood yielded during the preliminary trial week rather more milk than those of the B section; but before the end of the second week the positions were changed, not apparently from differences in air or temperature, but from the inherent capabilities of the cows. As a consequence, the B section of cows from the second week of the experiment have yielded about 100 lb. of milk weekly more than the A section, and if the experiment had been confined to these two lots of cows the results would have been interpreted as decidedly in favour of heat and restricted ventilation for the production of milk. These results are not, however, corroborated at the other centres, and more than anything else clearly indicate the necessity of all experiments with animals being conducted on such a large number that the exceptionally good or bad animals in each lot may in great part balance each other.

### *Byres.*

The buildings in which the cows were housed differ materially, and afford a good opportunity of comparing byres of different construction in regard to their suitability for the production of milk, the cleanliness of the milk, and the health of the cows producing it. With the exception of the one at Newton, all the byres may be said to be of comparatively recent

construction. The one at Newton was built sixty-five years ago, while none of the others will be over twenty years old.

The details of the various byres in which the cows were stalled are as follows:—

SUMMARY OF THE ACCOMMODATION, VENTILATION, &c., PROVIDED AT EACH CENTRE.

*A.—Byres Freely Ventilated.*

	Exposure.	Cubic capacity per cow in cubic ft.	Floor area per cow, sq. ft.	Lighting area per sq. ft.	Inlet ventilation per cow in sq. in.	Outlet ventilation per cow, sq. in.
Newton . .	open	525	38·8	1·35	38·2	225
Woodilee . .	open	1130	70·8	9·75	252	336
Hartwood . .	exposed	979	51·2	1·00	12	78
Crichton . .	open	1039	74·0	10·25	504	288
Rosslynlee . .	exposed	1268	64·0	33·00	476	206

*B.—Byres with Restricted Ventilation.*

	Height above sea-level.					
Newton . .	100 ft.	486·0	36·0	1·00	7	9
Woodilee . .	200	705·4	41·6	8·70	100	8
Hartwood . .	720	979·0	52·5	·93	37·5	72
Crichton . .	100	807·6	50·4	2·80	20	288
Rosslynlee . .	690	917·7	47·5	35·00	5·52	272·7

The main point of difference between the older and the more recent type of byres consists in the cubic capacity, the newer ones being practically double that of the older one. In floor area there is also a considerable difference between the older and newer buildings, and both of these are details which have remained constant since the byre at Newton was built.

In lighting area there is also a great difference between the byre at Newton and those built by the county and other authorities, with the exception of the byre at Hartwood, where it is much the same as at Newton. When erected the byre at Newton was not nearly so well lighted as now, the area of glass having been at least doubled by me within the last thirty years.

Hartwood and Rosslynlee are at a much higher altitude than any of the other centres, and are also the most exposed. In the freely ventilated byre, the available area for inlet ventilation is only about one-third of that at Newton. In this respect the

byre at Newton has always been the same. The area available for outlet ventilation does not differ materially in any of the byres, unless in the case of Hartwood, which is only from one-third to one-fourth of any of the others.

It is worthy of note in connection with the change which has come over public opinion in regard to this matter, that the building at Newton had no roof ventilation originally, and the area now available has been added at two different times within the last thirty years.

During the coldest of the weather, there were only three days during the first week in March, when the east wind was most piercing, that any of the inlet or outlet openings in the freely ventilated byre were altered. On these three days the inlets on the east were partially closed. At the other farms, owing to the greater cubic capacity of the byres, both inlet and outlet openings had been constantly changed, in the attempt to keep the temperature uniform.

In the B byres all openings, either for inlet or outlet ventilation, were as a rule closed during the coldest weather, and more or less opened as the season advanced. What is stated as openings for ventilation in regard to these byres is, therefore, the maximum which was available, and not in every case what was in daily use.

#### *Food used.*

None of the farms were in any way restricted in regard to the quantity or quality of the foods that they should use, each being allowed to follow the ordinary method in that respect. At Newton every description of food was weighed once a-week, and the quantity of meal given to each lot of cows was always prepared in a separate cooler. The roots, straw, and hay were divided by measure only, but once each week the quantity being used was weighed also. Much the same course was followed at each of the other farms, but on these the weight was checked less frequently than at Newton. The quantity used on each farm during the greater part of the winter was as follows:—

#### NEWTON.

Turnips (yellow) or mangold	43	lb. per cow per day.
Straw (oat)	9½	" " "
Hay (Italian and clover)	6½	" " "
Meals (bean, pea, rice and dec. cotton-cake)	8	" " "
Bran	1½	" " "
Treacle	½	" " "
Distillers' grains or draff (wet).	10	" " "

The roots were fed whole, mid-forenoon and afternoon, and the meals three times daily. A portion of the straw is cut as

long as possible, and mixed in each cooler with the meals and draff for each lot of animals. This is done immediately they have been fed. Hot water is then run on the mass in sufficient quantity to thoroughly wet it, the whole being left lying in this condition till next feeding-time, when it is fed at about blood-heat. There is always plenty of the coarsest of the straw left uneaten to sufficiently litter the animals.

## WOODILEE.

	Through the winter.	In spring.
Turnips . . . . .	28 lb. per cow per day.	Few or no turnips.
Straw (not stated).		
Hay . . . . .	9 " " "	9 lb.
Bean-meal . . . . .	4 " " "	7 "
Bibby-cake . . . . .	2 " " "	5 "
Thirds . . . . .	3 " " "	
		(Grains) 7 "

## CRICHTON.

Turnips or mangolds (raw) . . . . .	40 lb. per cow per day.
(Some of these are steamed).	
Hay . . . . .	11 " " "
Corn, chaff, or cut straw . . . . .	3½ " " "
Bean-meal . . . . .	3½ " " "
Undec. cotton-cake . . . . .	3 " " "

## HARTWOOD.

Turnips . . . . .	28 lb. per cow per day.
Straw . . . . .	7 " " "
Hay . . . . .	4 " " "
Bean-meal . . . . .	4 " " "
Bibby dairy meal . . . . .	3 " " "
Bran . . . . .	1½ " " "
Treacle . . . . .	1 " " "

## ROSSLYNLEE.

Turnips . . . . .	78 lb. per cow per day.
Straw . . . . .	24 " " "
Pease-meal . . . . .	3 " " "
Compound cake . . . . .	2½ " " "
Dried brewers' grains . . . . .	2 " " "
Cummins (barley sprouts) . . . . .	2½ " " "

*Age and Date of Calving of the Cows.*

At Newton the average age of the cows in A byre was 5·7 years, while those of the B byre was 5·6 years. The average date of calving of the cows in the A section was 6th September, while those of the B section was 2nd September. There was only one recently calved cow in each lot, the others had calved between the beginning of August and the end of October.

While those of the A section were on the average four days earlier calved than the others, those of the B section were on an average one month younger, so that whatever trifling gain either of the lots had in the one respect they lost it in the other, and on the whole they may be looked on as fairly evenly balanced.

At Rosslynlee the cows used were Shorthorn or Shorthorn crosses, the average age of those in the A section being 8·7 years and that of the B section 8 years. Those in the A byre had an average weight of 10·4 cwt., while those in the B byre weighed 10·3 cwt. The average date of calving of those in the A section was 3rd October, while those in the B section was 2nd October.

*The Effect of two particularly Mild and Calm Periods compared with several Excessively Cold Days between them.*

A period of exceptionally mild weather prevailed for over a week prior to 26th December 1908. This was followed by four excessively cold days,—on 27th, 28th, 29th, and 30th,—and very mild weather again set in on 1st January 1909. The opportunity was taken to find out what effect these rapid and excessive changes of temperature had on the yield of milk and percentage of fat in it. For this purpose the yield of four of the mild days immediately preceding the cold ones was taken, and also that of four of the warm ones immediately after them. It was necessary to adopt this course, as all the cows were gradually shrinking in their milk at this date, and by taking any certain number of days during the cold snap, and a similar number both before and after, with an intermediate one between, the daily yield of milk during the cold snap should have equalled the mean of a similar number of days before and after it, and any difference might reasonably be considered as due to temperature alone.

All the farms where the cows were under supervision at this date are dealt with in exactly the same way, as they were all somewhat similarly affected by the cold period.

It will be noticed (Table I., p. 273) that during the warm period the freely ventilated or cool byre A at Newton had an average temperature of 54·6° F., which was about 4·5° F. above what it had usually been kept at. This could not be lessened, as not only was every ventilator in the walls and roof open, but six skylights in the roof were constantly open as well as three doors. Although the temperature of this byre was high compared with what it is usually kept at, many milk producers would have considered it cold.

TABLE I.—NEWTON.

## WARM PERIOD.

Date.	A.—BYRE, 18 COWS, FREELY VENTILATED.					B.—BYRE, 18 COWS, RESTRICTED VENTILATION.				
	Morning.			Evening.		Morning.			Evening.	
	Total milk per milking in lb.	Average per cent of fat.	Average temperature of the byre.	Total milk per milking in lb.	Average per cent of fat.	Total milk per milking in lb.	Average per cent of fat.	Average temperature of the byre.	Total milk per milking in lb.	Average per cent of fat.
1908. Dec. 20	276.0	*	56.2	198.5	3.90	266.0	*	65.0	200.0	4.07
" 21	276.0	3.45	53.2	221.0	3.77	266.0	3.43	66.8	221.0	3.67
" 22	271.0	3.48	56.9	223.0	3.87	266.0	3.36	66.4	229.5	3.58
" 23	262.0	3.63	54.3	227.0	3.99	269.0	3.42	65.3	216.0	3.61
1909. Jan. 1	264.0	3.61	54.0	225.0	4.05	270.5	3.39	63.2	229.5	3.90
" 2	292.0	3.63	54.2	218.5	*	274.0	3.44	62.3	229.0	*
" 3	283.0	*	54.2	211.5	3.98	280.0	*	62.4	216.5	3.92
" 4	279.5	3.52	54.3	214.0	4.08	271.0	3.41	61.7	217.5	3.95
Total	2203.5	21.32	437.3	1738.5	27.64	2162.5	20.45	513.1	1759.0	26.70
Average per milking }	275.4	3.55	54.6	217.3	3.95	270.3	3.41	64.1	219.9	3.81

## VERY COLD AND STORMY PERIOD.

1908. Dec. 27	280.5	*	42.5	215.0	3.77	264.5	*	56.5	214.5	3.85
" 28	278.5	3.51	38.75	214.0	3.79	278.0	3.26	50.7	226.5	3.84
" 29	268.5	3.37	36.5	225.0	4.01	267.0	3.51	52.2	230.5	3.58
" 30	275.5	3.34	41.5	224.0	3.89	275.0	3.34	56.3	216.5	3.69
Total	1103.0	10.22	159.25	878.0	15.46	1084.5	10.11	215.7	888.0	14.96
Average per milking }	275.7	3.41	39.81	219.5	3.86	271.1	3.37	53.9	222.0	3.90
Average of—										
8 warm days	275.4	3.55	54.6	217.3	3.95	270.3	3.41	64.1	219.9	3.81
4 cold days	275.7	3.41	39.81	219.5	3.86	271.1	3.37	53.9	222.0	3.90
Average milk per day from 18 cows for—						Average milk per day from 18 cows for—				
8 warm days . . .			54.6	492.7	3.73	8 warm days		64.1	490.2	3.61
4 cold days . . .			39.8	495.2	3.61	4 cold days		53.9	493.1	3.65
Difference in temperature between the two periods }			14.8	...	...	Difference in temperature between the two periods }		10.2	...	...
Increase of milk from 18 cows per day during the cold period }				2.5	...	Increase in milk per day during the cold period }			2.9	...
Increase in per cent of fat during the warm period }					.12	Increase in fat during the cold period }				.04

\* These dates are Sundays, on which no estimations of fat were made.

The B byre, or one with restricted ventilation, had a high temperature on several of the days, but was not warm when compared with ordinary summer heat, but on entering it from the fresh air it felt close and oppressive. The air was invariably loaded with moisture, and usually contained from 5 to 7 per cent of the total quantity it was capable of holding in suspension. When this moisture-loaded air issued from the ventilators, or came in contact with the cool glass of the roof-lights, it invariably in cold weather deposited its moisture on the slates, or if on the glass, it ran down the glass on the inside and out under the iron frame of the skylight on to the slates, which were usually wet below the ventilators or roof-lights. It is probable that during the early part of this period the cows in the B or warm byre felt oppressed by the heat or moisture in the air, or both, as their yield of milk was less than it was a fortnight later, and the difference between them and the freely ventilated ones was greater than usual.

The cold snap was a veritable blizzard while it lasted, the coldest day being 29th December (Tuesday), on which date the temperature for the whole twenty-four hours only averaged 36·5° F., while it was as low as between 34° and 35° F. for a considerable part of the day.

What will surprise most people is that 38 cows in full milk, one-half of which were previously kept close and warm, should yield as much milk during the cold snap as the warm one. The cows in the A byre, on an average of the four coldest days of the season, actually gave fully as much milk as they did during the very pleasant weather which preceded and succeeded this blizzard.

The cows in the freely ventilated byre had been kept cool all autumn, and, of course, were more or less prepared for this cold blast; but those in the B byre, with restricted ventilation, had been subjected to a warm, moist atmosphere for the last six weeks, and would generally be said to be ill prepared for such weather. They seemed to suffer on the first cold day, as they yielded on that date almost a gallon less milk than they had been doing previously, but on the next and following days they made it all up, and on the average of these four cold days gave fully as much milk as they gave during the good weather before or after.

Both lots of cows have a very slightly lower percentage of fat in the milk of the cold period than in that of the mild one. In the case of the freely ventilated ones it amounts to ·14 per cent, and in that of the others to ·04 per cent. Both of these shrinkages in per cent of fat are quite trifling, and might easily be accounted for by a little irregularity in the milking, although the probability is that it was to some extent influenced by the weather.

The most of these cows were from three to four months calved, and a month before this had been divided, after a preliminary weighing of the milk of each cow twice daily for seventeen days, so that the presumption is that the division was accurate then. At the time of division both lots were identical in yield not only in weight of milk but also in per cent of fat, so that they could not be very dissimilar at the end of the first month. During the cold snap the freely ventilated building had an average temperature of  $39.81^{\circ}$  F., while the other byre during the week before and after had an average temperature of  $64.1^{\circ}$  F., so that the difference between the two was  $24.3^{\circ}$  F.; yet the cows in the coldest building gave rather more milk than the others.

This is quite a wide range of temperature, much more than we are accustomed to in this country, although much less than is common in Canada, Russia, Norway, Sweden, Denmark, or even the most of Central Europe. If this wide range makes little or no impression on the flow of milk or health of the cows, we need not seriously concern ourselves about keeping them warm, provided they are dry, out of draughts, and have plenty of fresh air. Our climate, much as it has been reviled, seems to be sufficiently mild in winter to permit of all byres under all circumstances being freely ventilated, and no European climate offers the same facilities as that of Britain for freely supplying all stock with fresh air during winter.

#### *Woodilee.*

The buildings at Woodilee are much greater in cubic capacity per cow than those at Newton, and in consequence none of the byres ever became so warm as those at the latter. Unfortunately, the thermograph sheet for the cold week went amissing, so that it is not possible to work out the daily average temperature of these byres as in the other cases. From the readings of the wet and dry bulb thermometers in the early morning of 29th December it seems that they were exactly the same as those at Newton that same morning, so that the probability is that the two sets of buildings did not materially differ in temperature during these four days.

Contrary to the results at Newton, the cows occupying the freely ventilated building did scarcely so well in the mild weather as the others, even although they had more than 50 per cent extra cubic capacity per cow. In the cold snap the conditions were very much the same, as those in the building with restricted ventilation did better than the others. At this farm the A byre, or one with free ventilation, has a cubic capacity per cow of 1131 ft., while the B byre has only 700 cubic feet. The probability is that in the very large building

TABLE II.—WOODILEE ASYLUM FARM.

## WARM PERIOD.

Date.	A.—BYRE OF 10 COWS, FREELY VENTILATED.					B.—BYRE OF 10 COWS, WITH RESTRICTED VENTILATION.				
	Morning.			Evening.		Morning.			Evening.	
	Total milk per milking in lb.	Average per cent of fat.	Average temperature of the byre.	Total milk per milking in lb.	Average per cent of fat.	Total milk per milking in lb.	Average per cent of fat.	Average temperature of the byre.	Total milk per milking in lb.	Average per cent of fat.
1908. Dec. 20	162.5	3.2	56.2	118.5	3.2	153.25	3.0	61.5	124.5	3.6
" 21	161.0	3.2	46.0	113.5	4.0	157.25	3.2	53.1	123.0	3.55
" 22	155.0	3.3	48.2	108.5	3.6	158.75	3.05	53.7	119.5	3.6
" 23	157.5	3.25	50.0	109.5	3.6	160.0	3.0	55.5	121.5	3.8
1909. Jan. 1	154.0	3.20	*	119.0	3.6	153.5	3.0	*	110.25	3.4
" 2	155.5	3.0	*	102.5	3.4	148.0	2.80	*	112.75	3.6
" 3	147.5	3.0	*	110.5	3.5	149.25	3.0	*	108.75	3.8
" 4	148.0	...	51.8	103.0	3.6	149.25	...	62.0	112.25	3.7
Total	1241.0	22.15	252.2	880.0	28.5	1229.25	21.05	285.8	932.50	29.05
Average per milking	155.1	3.16	50.4	110.0	3.56	153.65	3.01	57.1	116.56	3.63

## VERY COLD AND STORMY PERIOD.

1908. Dec. 27	157.0	3.3	*	112.5	3.7	161.0	3.2	*	116.75	3.4	
" 28	150.5	3.35	*	107.0	3.6	148.75	2.8	*	102.50	3.8	
" 29	147.0	3.2	*	113.0	3.6	150.75	3.3	*	107.25	3.8	
" 30	142.5	3.15	*	105.5	3.4	147.50	3.2	*	118.25	3.7	
Total Average per milking }	597.0	13.0	...	438.0	14.3	608.0	12.5	...	444.75	14.7	
	149.25	3.25	...	109.5	3.57	152.0	3.12	...	111.19	3.67	
Average of— 8 warm days 4 cold days	151.5	3.16	50.4	110.0	3.56	153.65	3.01	57.1	116.56	3.63	
	149.25	3.25	...	109.5	3.57	152.0	3.12	...	111.19	3.67	
Average milk per day from 10 cows for—					Average milk per day from 10 cows for—						
8 warm days . . .			50.4	265.12	3.37	8 warm days			57.1	270.22	3.34
4 cold days . . .			?	258.75	3.41	4 cold days			?	263.19	3.40
Difference in temperature between the two periods }			?	...	...	Difference in temperature between the two periods }			?	...	...
Gain of milk per day by 10 cows during the very mild weather }				6.37	...	Gain of milk per day by 10 cows during the very mild weather }				7.03	...
Increase in per cent of fat during the very cold weather }					.04	Increase in per cent of fat during the very cold weather }					.06
Total weight of butter-fat yielded per day by 10 cows during a warm period of 8 days					lb. 984	Total weight of butter-fat yielded per day by 10 cows during a warm period of 8 days					lb. 9.028
Total weight of butter-fat yielded per day by the same 10 cows during a cold period of 4 days					8.823	Total weight of butter-fat yielded per day by the same 10 cows dur- ing a cold period of 4 days					8.945
Gain per day by 10 cows during the warm period .					1.11	Gain per day by 10 cows during the warm period					.077

\* Lost in passing through the post-office.

the cows were less comfortable during these cold days than the others were in the more moderate-sized byre. Judged from the readings of the wet and dry bulb thermometers, the A byre does not seem to have been unusually cold other than on the morning of the 29th, and it may be that some other influence was at work during this period than that of temperature. It is, however, worthy of note that both lots of cows did better during the mild weather than that which was very cold.

While the increase in milk during the mild weather is considerable over the cold time, there is no appreciable difference in the fat of either period. No just comparison can be made between the per cent of fat of lots A and B, as when they were divided the per cent of fat yielded by each was not known. The fat yielded by the same lot of cows during the mild period, and again when it was cold, is, however, quite comparable, and with both lots of cows it is highest during the cold period, although the difference is very trifling. (Table II., p. 276.)

#### *Crichton Institution.*

The byre which was used at Crichton Institution was a wooden one, which had been erected a few years ago for temporary purposes. All that was thought would be necessary to prepare it for this experiment was to divide it by a suitable partition, which was done. It was, however, found that during stormy weather the temperature of the B or warm byre could not be maintained at 60° F., even with all ventilators closed. The wood framing was, therefore, covered on the inside as well as on the outside with another lining of wood, which had the desired result of increasing the heat.

During the warm period the temperature of the freely ventilated byre was almost 2° F. higher on the average than at Newton, notwithstanding that the cubic capacity per cow was double what it was here. The inlet ventilating area of this byre is much the largest of those embraced in the experiment, and it seems that during this period the ventilating area was only partially utilised. At this time the temperature of the B byre was on the average about 2° F. cooler than at Newton, which would be accounted for by the greater cubic capacity.

Both lots of cows seemed to be affected by the weather to much the same extent. Those always kept freely ventilated and cool gave 3.3 lb. more milk per day from eight cows during the warm period, than the same cows did on the average of the cold one. This increase in milk is very trifling when it is considered that there was a difference in the average temperature of the two periods of 13.1° F. The cows which had been previously kept warm seemed to suffer even less than the

TABLE III.—CRICHTON ROYAL INSTITUTION.

## WARM PERIOD.

Date.	A.—BYRE OF 8 COWS, FREELY VENTILATED.			B.—BYRE OF 8 COWS, WITH RESTRICTED VENTILATION.		
	Morning.		Evening.	Morning.		Evening.
	Total milk per milking in lb.	Average temperature of the byre.	Total milk per milking in lb.	Total milk per milking in lb.	Average temperature of the byre.	Total milk per milking in lb.
1908. Dec. 20	129.5	57.1	106.5	129.5	62.0	107.0
" " 21	127.5	54.5	106.0	125.0	61.2	107.0
" " 22	127.5	54.8	107.5	124.5	59.2	107.0
" " 23	128.0	55.8	105.5	123.5	63.2	101.5
1909. Jan. 1	117.5	55.6	97.0	115.5	61.2	98.0
" " 2	119.0	56.4	98.5	120.0	63.3	101.5
" " 3	117.5	58.3	98.5	118.0	63.5	100.0
" " 4	116.0	57.7	98.5	116.5	63.7	97.5
Total	982.5	450.2	818.0	972.5	497.3	819.5
Average per milking	122.8	56.3	102.25	121.56	62.2	102.4

## VERY COLD AND STORMY PERIOD.

1908. Dec. 27	123.0	42.1	104.5	118.5	53.8	103.5
" 28	120.5	41.9	101.5	119.5	47.8	101.5
" 29	121.0	38.9	99.5	121.0	48.1	99.5
" 30	120.5	49.8	97.0	122.5	57.0	99.0
Total . . .	485.0	172.7	402.5	481.5	206.7	403.5
Average per } milking	121.25	43.2	100.6	120.4	51.7	100.9
Average of—						
8 warm days	122.81	56.3	102.25	121.56	62.2	102.4
4 cold days .	121.25	43.2	100.60	120.40	51.7	100.9
Average milk per day from 8 cows for—				Average milk per day from 8 cows for—		
8 warm days . . .	56.3	225.0	8 warm days	62.2	224.0	
4 cold days . . .	43.2	221.7	4 cold days	51.7	221.25	
Difference in temperature between the two periods	} 13.1	...	Difference in temperature between the two periods	} 10.5	...	
Increase of milk per day from 8 cows during the very mild weather	} 3.3		Increase of milk per day from 8 cows during the mild weather	} 2.75		

others, for their loss of milk was only 2.75 lb. of milk per day out of a total of 224 lb. In their case the difference in the temperature of the byre of the two periods was 10.5° F., so that even they do not seem to have been anything more than temporarily affected by the cold weather. If the average yield of both lots of cows be taken for the warm period, and the total compared with what it was during the cold days, there is a shrinkage of only a trifle over  $\frac{1}{2}$  gallon per day on a total production of 45 gallons, or a loss for the excessively cold period compared with an unusually mild one of slightly over 1 per cent only.

This herd was not tested daily for fat, so that no opportunity was afforded of noting what effect, if any, the cold had on the percentage of fat in the milk. (Table III., p. 278.)

### *Hartwood.*

The buildings here are at a much higher altitude above sea-level than those previously referred to. They are also in about as exposed a situation as it is possible to find. Both byres are identical in cubic capacity per cow—viz., 979 cubic feet per cow, which is a very unusual size for that district, and more especially when the moderate size of the cows (Ayrshires) is taken into account.

During the warm weather the freely ventilated byre here had an average temperature of 53.7° F., which is the lowest for that period of the whole four centres, Newton being about 1° F. higher. Byre B, which was restricted in ventilation, had an average temperature of 63.5° F., which is .6° F. less than the average of the same byre at Newton. Although, therefore, there was a difference in altitude of 500 feet, these two sets of byres more closely resemble each other in temperature than any of the others. During this period the A lot, which had all along been kept freely ventilated and cool, yielded a trifle more milk than those which had had the ventilation restricted and had been kept warm.

During the cold weather the average temperature of the A or freely ventilated byre works out at 40.5° F., while the corresponding byre at Newton during the same period was 39.8° F. It therefore seems as if the ventilation had been somewhat restricted during this interval, as, owing to the higher elevation and exposure, a lower temperature would have been expected to be recorded than at Newton. The average temperature for the B byre for this period was, however, 2.6° F. less than at Newton, which clearly indicates the severity of the cold during this period. During this time, when both lots of cows might be said to be kept cold, and when there was even then a difference of about 11° F. between the temperatures at which

TABLE IV.—LANARK DISTRICT ASYLUM,  
HARTWOOD.  
WARM PERIOD.

Date.	A.—BYRE OF 8 COWS, FREELY VENTILATED.			B.—BYRE OF 8 COWS, WITH RESTRICTED VENTILATION.		
	Morning.		Evening.	Morning.		Evening.
	Total milk per milking in lb.	Average temperature of the byre.	Total milk per milking in lb.	Total milk per milking in lb.	Average temperature of the byre.	Total milk per milking in lb.
1908. Dec. 20	154	54·5	130	158	63·9	131
" 21	146	54·2	145	160	64·9	128
" 22	149	54·2	135	158	67·7	136
" 23	148	53·0	125	157	62·5	134
1909. Jan. 1	165	53·8	146	154	61·4	137
" 2	162	52·9	135	158	62·4	132
" 3	155	53·9	135	150	61·5	124
" 4	158	53·0	142	156	63·2	123
Total . . .	1237	429·5	1093	1251	507·7	1045
Average per milking }	154·6	53·7	136·6	156·4	63·5	130·6

VERY COLD AND STORMY PERIOD.

1908. Dec. 27	154	43·2	138	161	54·0	140
" 28	163	38·7	143	162	51·0	140
" 29	163	37·9	145	166	47·5	135
" 30	163	42·2	141	162	52·7	137
Total . . .	643	162·0	567	651	205·2	552
Average per milking }	160·7	40·5	141·7	162·7	51·3	138·0
Average of—						
8 warm days	154·6	53·7	136·6	156·4	63·5	130·6
4 cold days .	160·7	40·5	141·7	162·7	51·3	138·0
Average milk per day from 8 cows for—				Average milk per day from 8 cows for—		
8 warm days . . .	55·7	291·2		8 warm days	63·5	287·0
4 cold days . . .	40·5	302·5		4 cold days	51·3	300·7
Difference in temperature between the two periods }	15·2	...		Difference in temperature between the two periods }	12·2	...
Increase of milk per day from 8 cows during the cold period }		11·3		Increase of milk per day from 8 cows during the cold period }		13·7

they were kept, those kept coldest gave fully as much milk as the others.

The best and most reliable comparison is made when the yield of the same cows is considered for the two periods. For the A lot the average daily yield during the warm period was 291.2 lb. of milk, against 302.5 lb. during the cold time. Between the two periods there was an average difference of temperature of 13.2° F., and yet there was no shrinkage of milk. With the cows which had always been kept warm the yield was 287 lb. milk daily during the mild period, while during the cold weather it averaged 300.7 lb. daily. With both lots of cows the lowest yield was in the morning of the first really cold day, but the lowest evening yield was on the afternoon of the coldest day. On this date the average for the whole twenty-four hours was 37.9° F., which is 1.4° F. above what was recorded at Newton. The minimum temperature recorded was 34° F., at which figure the A byre remained for eight hours, which was almost identical with what was recorded at Newton.

The percentage of fat in the milk was not estimated for each day at this date, so that no information can be drawn from the experiment in regard to it. (Table IV., p. 280.)

#### *General Effects of the Cold Snap.*

The general effect of the cold days of 27th, 28th, 29th, and 30th December on the milk of all the herds, compared with the average of what it was on four very mild days immediately before and after that period, may be summarised as in Table V., p. 282.

From the foregoing table it will be seen that when all the cows embraced in the experiment at this date are slumped together, the ones in freely ventilated byres, which were housed during the warm period at an average temperature of 53.76° F., yielded an average of 29.0 lb. of milk per day, whereas the others stalled in a temperature of 61.73° F. gave 28.9 lb. daily. During the cold snap both of these lots of 44 cows yielded on the average of four days exactly the same total weight of milk—viz., 1278.1 lb. This is somewhat remarkable, seeing that the one lot were stalled in buildings having an average temperature of 41.2° F., and the other at 52.3° F.

We find that the cows in the freely ventilated byres gave on an average a trifle more milk during the cold period than they did during the warm period, when the temperature of the air of the byres was on the average 12.5° F. higher. The same applies to those which had been restricted in ventilation and been kept warm, only in their case the increase during the cold period is a trifle more.

TABLE V.  
WARM PERIOD.

Farm.	No of cows in each lot.	A.—BYRE, FREELY VENTILATED.			B.—BYRE, RESTRICTED VENTILATION.		
		Total average milk per day in lb.	Average per cent of fat.	Average temperature of the byre.	Total average milk per day in lb.	Average per cent of fat.	Average temperature of the byre.
Newton . .	18	492.7	3.73	54.66	490.2	3.61	64.14
Woodilee . .	10	265.1	3.37	50.40	270.2	3.34	57.10
Crichton . .	8	225.0	*	56.30	224.0	*	62.20
Hartwood . .	8	291.2	*	53.70	287.0	*	63.50
	44	1274.0	...	215.06	1271.4	...	246.94
Average per cow	...	29.0	...	53.76	28.9	...	61.73
COLD PERIOD.							
Newton . .	18	495.2	3.61	39.8	493.1	3.65	53.9
Woodilee . .	10	258.7	3.41	†	263.1	3.40	†
Crichton . .	8	221.7	*	43.2	221.2	*	51.7
Hartwood . .	8	302.5	*	40.5	300.7	*	51.3
	44	1278.1	...	123.5	1278.1	...	156.9
Average per cow	...	29.0	...	41.2	29.0	...	52.3

\* Fat not estimated daily at this date.

† Lost during transmission by post.

The above figures clearly indicate that, notwithstanding slight discrepancies which existed in the division of the lots, the animals over the whole must have been divided into almost identical lots. Taken as a whole, the two lots offer the opportunity of comparing the effects on the milk yield of a high temperature with a very low one. At an average temperature of 61.73° F. the daily yield of milk for 44 cows for eight days was 28.9 lb., while for the corresponding lot for four days, at a temperature of 41.2° F., the average daily yield was 29.0 lb. There is here a difference in temperature of 20.5° F., yet the yield in both cases may be said to be identical.

In the two periods we have been dealing with there are eight comparisons of herds which have been freely ventilated, compared with eight others which have had their ventilation restricted, and each of these embrace 88 cows. The freely ventilated lot have yielded the most in six cases, embracing 68 cows; while in the other two cases, embracing 20 cows, the heaviest yield has been from the cows which were kept warm.

*Variations in the per cent of Fat in the Milk.*

From a careful comparison each week of the yield of milk and butter fat of every cow in the experiment with what it was previously, I am thoroughly satisfied that, as far as the feeding of the cows, the weighing of the milk, the sampling of it, and the estimation of its per cent of fat are concerned, the whole of the work has been done in a careful and reliable manner. The uniformity in the quantity and quality of the milk yielded by each cow per week is very remarkable. During the period when their milk yield was constant three-fourths of them, although giving from 200 to 300 lb. per week, yielded within a very few lb. what they had done the week before. Where the difference was much over a gallon on the total yield of the week, there usually had been more or less sickness of some kind.

While the uniformity in the yield of milk indicated good milking all over, there were a number of cows the milk of which varied in fat much more than the others. Like other experimenters with milk cows, I had previously looked on this variation as being in some way the result of weather, health, food, &c.; but from a close study of the individual cows and milkers employed in this experiment, I have now come to the conclusion that much of this irregularity is the result of careless or indifferent milking. From a previous inquiry into the per cent of fat in the milk of cows during their period of lactation, and for which several hundred animals were used, the date of calving of each of which was known, and from which all risk of distortion of results from irregularity of milking or peculiarity in the cows was obliterated, the results clearly indicated that the per cent of fat in the milk of the average cow gradually decreases till between the fourth and sixth week after calving, from which date it slowly improves. Leaving that variation out of account, and any other which may be the result of sickness or special food, I am now of opinion that with cows in normal health there should be little variation in the per cent of fat in the milk if the milking is perfect. It seems to me that it is this want of perfection in the milking, and the difficulty of finding it out, that have given

rise to the impression that the per cent of fat in the milk of every cow varies from day to day, and from causes over which we have no control.

In the morning and evening tests for fat in the milk of each cow at Newton, it was found that while about thirty of the cows gave very steady percentages of fat, three or four in each lot were very irregular. Almost all the cows which yielded a uniform quality of milk were at least no worse than average cows to milk, while those which were irregular had either small teats, or from some other cause were more difficult to milk. All the milkers were considered to be equally good, although all were probably not alike careful or reliable. In the preliminary stages of the experiment it was considered desirable to keep a note of the cows milked by each person. In a few days this revealed the facts that the irregularity in the fat of the milk of these few cows occurred almost entirely when they were milked by two persons, and that when milked by the others they were almost as uniform as could be. The milkers' attention was drawn to the discrepancy, after which the irregularity was very much lessened. One of the faulty milkers was off through sickness for three or four weeks at the outset, but as soon as she began the irregularity in the percentage of fat in the milk of these cows at once started, and continued as long as this person was milking, which, fortunately, was only for a few weeks.

In order to attempt to throw some light on this question, those in charge of the cows at each of the other centres were asked in March to give me a statement regarding every cow whether it was easy, average, or difficult to milk. That statement brought out the fact that every cow which was considered easy to milk varied little or none in the weekly average per cent of fat, other than what might be expected from errors in sampling, testing, milking, or advance in lactation. With the cows returned as average in regard to milking, a few were irregular, but the bulk were steady, while those marked as difficult to milk were invariably irregular in the per cent of fat. All this points to the desirability of every one working with cows giving increased attention to the milking, and breeding only from such cows as are easy to milk. This has always been known, and the necessity for care in this work is not a matter of to-day, but even among those who are constantly working with cows, it is only a small number who seem to realise the value of a really good and reliable milker compared with an indifferent one.

It may not be borne out by future experience, but it seems to me that with cows which can be freely milked, and with efficient and reliable milkers, there should at least be no diffi-

culty in getting uniform percentages of fat from weekly composite samples of milk. There may be more variability in the daily samples, and it may never be possible to get these quite uniform, but the moment it is realised that efficient milking is probably the most important factor in attaining this result, means may be taken to reduce the variation to the lowest limit. Good milking is at all times desirable, but for experimental work none but the most efficient and trustworthy persons should be employed, when, I think, this question of variability should in great part disappear.

### *Another Cold Period.*

Another period of cold weather occurred during the first two weeks of March. The fortnight previous to this had been exceptionally mild for the time of the year, and the second half of March, although by no means warm, was mild compared with the first two weeks. At Newton the minimum temperature outside during the night, and maximum during the day, have been taken since the experiment began, in order that they might be available should any question arise regarding which it was desirable to know what the outside temperatures were. During the first week in March there was frost every night, the minimum temperature for the week averaging  $24^{\circ}$  F. or  $8^{\circ}$  F. of frost. The second week was a little warmer, but there was also frost every night, the average minimum temperatures for the week being  $31^{\circ}$  F. or  $1^{\circ}$  F. of frost. The maximum shade temperatures during the first week averaged only  $36.5^{\circ}$  F. or  $4.5^{\circ}$  F. above the freezing-point, those for the second week being  $40.2^{\circ}$  F. or  $7.8^{\circ}$  F. above the freezing-point. The cold of both weeks was accompanied by a bitter east wind of considerable force, which was much more uncomfortable than any lowering of the temperature, and unless the ventilation was considerably reduced, the air of the byres was changed so quickly that the temperature soon fell.

The opportunity has therefore been taken to see what effect this period would have on the quantity and quality of milk, and for this purpose the total yield of each lot of cows is given for two weeks. The yield of milk of all the cows had been gradually becoming less for a considerable time owing to the length of time they had been in milk. On this account the yield for the warm period is taken at the average of the two weeks before the cold fortnight and the two weeks after it. In the case of Hartwood and Rosslynlee one or two cows which had been giving very little milk had been withdrawn from each section at the end of the third week, and in their case the yield of the warm period is taken for the week before and

the week after the cold fortnight, each lot being credited with two weeks' milk. With these exceptions there were no other change of cows during the period under review, so that the yield under the different conditions should be quite comparable, and should show the effect of such periods of weather.

AVERAGE TEMPERATURE OF THE AIR OF THE A BYRES DURING THE WARM AND COLD WEEKS OF FEBRUARY AND MARCH.

Farm.	Warm period.	Cold period.	Difference.
Newton . . . . .	51·70° F.	44·85° F.	6·85° F.
Woodilee . . . . .	51·50 "	49·78 "	1·72 "
Crichton . . . . .	49·95 "	46·30 "	3·65 "
Hartwood . . . . .	47·35 "	43·30 "	3·05 "
Rosslynlee . . . . .	48·60 "	46·95 "	1·65 "
Average in proportion to the number of cows sub- jected to each temperature }	50·31 "	46·07 "	4·24 "

As will be seen from the above table, the greatest difference in temperature of the A byre during the two periods was at Newton,—not that it was in a colder climate or more exposed than any of the others, but because the ventilators were kept fully open all the time, with the exception of three days when the wall ventilators were partially closed on the windy side. The difference in temperature between the two periods at Woodilee and Rosslynlee is so small that apparently at both farms the ventilation has been restricted so as to keep it as near 50° F. as possible, as had been suggested in the instructions sent to each person in charge of the experiment. This was done purposely, as it would have been hopeless to expect people who had hitherto had no experience of producing milk under these conditions to keep their byres freely ventilated in such weather.

While there was some trifling reduction in the yield of milk at some of the farms at the beginning of the cold weather, it seemed only to last for a day or two, and the totals for the fortnight may be considered identical both for quantity and quality. In this respect most of the herds corroborate each other, and the results correspond with those obtained during a shorter period earlier in the year. The herd at Woodilee is the only one which gives a result which may be called irregular, or which may be said to be scarcely uniform with the others. The shrinkage in the milk of the cows at this farm has not been quite uniform, and I am satisfied that the apparent increase during the cold weather is brought about by influences other than air or temperature, as during the two periods there was a difference of only 1·72° F. in the heat of the byre during

the two periods. Instead of showing the greatest variation in yield, one would naturally have expected this herd to be almost uniform.

THE FOLLOWING TABLE GIVES THE TOTAL MILK PRODUCED AT EACH FARM BY THE COWS IN THE FREELY VENTILATED BYRES FOR AN AVERAGE OF THE LAST TWO WEEKS OF FEBRUARY AND THE LAST TWO OF MARCH, COMPARED WITH THE FIRST TWO WEEKS OF MARCH WHEN THE WEATHER WAS BITTERLY COLD.

A BYRES.—FREELY VENTILATED.

FARM.	MILD WEATHER. 14th to 27th February. 14th to 27th March.			COLD WEATHER. 28th February to 13th March.		
	Total milk in lb.	Avg. milk daily.	Avg. per cent of fat.	Total milk in lb.	Avg. milk daily.	Avg. per cent of fat.
Newton . . .	6,438·7	25·5	3·80	6,406·0	25·4	3·85
Woodilee . . .	3,073·4	21·6	3·43	3,185·2	22·7	3·45
Crichton . . .	2,529·0	22·6	3·63	2,504·5	22·3	3·57
Hartwood* . .	3,255·0	29·0	3·43	3,292·0	29·4	3·61
Rosslynlee* . .	2,409·0	28·7	3·73	2,416·0	28·7	3·85
Total for 50 cows for 14 days }	17,705·1	...	...	17,803·7	...	...
Average . . .	...	25·3	3·63	...	25·4	3·69
Average exclud- ing Woodilee }	14,631·7	26·1	...	14,618·5	26·1	...

\* In these cases the average yield of the mild weather extends over one week before the first week in March, and another after the second week. There were changes in cows at the beginning of the fourth week in March, which prevented the yield of that week being included, as has been done with the other farms.

At Rosslynlee, where the air of the byres had about the same difference in temperature, the yield during both periods is almost identical. If one refers to the tables on pp. 291, 292, where the weekly yield of milk of each herd is stated, one observes that the weight of milk produced by this herd has shrunk at a much quicker rate during the third week in March than at any time during the previous month. On that account the comparison is unfair, and for the purpose of this part of the inquiry the herd at Woodilee should be excluded. If this is done, all the other herds give fairly uniform results, and may be considered quite reliable; and if these results are corroborated in the years to come, it seems as if milk producers had little to fear from any cold to which their cows are likely to be subjected in this country.

Two of the B byres—viz., those at Crichton and Rosslynlee—showed almost no variation in temperature during the period under review. Like all the other places, these are provided with efficient arrangements for regulating the ventilation, and notwithstanding the extremes of temperature outside the at-

tendants have been able to keep the air of these byres at a uniform heat.

AVERAGE TEMPERATURE OF THE AIR OF THE B BYRES DURING THE WARM AND COLD WEEKS OF FEBRUARY AND MARCH.

Farm.	Warm period.	Cold period.	Difference.
Newton . . . .	63·02° F.	56·75° F.	6·27° F.
Woodilee . . . .	60·70 "	58·58 "	2·12 "
Crichton . . . .	59·50 "	59·30 "	·20 "
Hartwood . . . .	55·60 "	51·15 "	4·45 "
Rosslynlee . . . .	57·25 "	57·15 "	·10 "
Average in proportion to the number of cows subjected to each temperature }	60·11 "	56·67 "	3·44 "

The same has happened with the B byre at Woodilee as occurred with the A byre—viz., that the cows have shrunk in their yield of milk very much more rapidly during the third and fourth weeks of March than they did at any time during the previous month. This has happened from natural causes quite irrespective of weather.

THE FOLLOWING TABLE GIVES THE TOTAL MILK PRODUCED AT EACH FARM BY THE COWS IN THE RESTRICTED VENTILATED BYRES FOR AN AVERAGE OF THE LAST TWO WEEKS OF FEBRUARY AND THE LAST TWO OF MARCH, COMPARED WITH THE FIRST TWO WEEKS OF MARCH WHEN THE WEATHER WAS BITTERLY COLD.

B BYRES.—RESTRICTED VENTILATION.

FARM.	MILD WEATHER. 14th to 27th February. 14th to 27th March.			COLD WEATHER 28th February to 13th March.		
	Total milk in lb.	Avg. milk daily.	Avg. per cent of fat.	Total milk in lb.	Avg. milk daily.	Avg. per cent of fat.
Newton . . . .	6,171·0	24·5	3·71	6,187·5	24·3	3·74
Woodilee . . . .	3,091·3	22·1	3·26	3,217·5	22·9	3·17
Crichton . . . .	2,576·5	23·0	3·41	2,532·5	22·6	3·37
Hartwood* . . .	3,627·0	32·3	3·47	3,633·0	32·3	3·61
Rosslynlee* . .	2,316·5	27·5	3·28	2,296·5	27·3	3·39
Total for 50 cows for 14 days }	17,782·3	...	...	17,817·0	...	...
Average . . .	...	25·40	3·48	...	25·45	3·51
Average exclud- ing Woodilee }	14,691·0	26·2	...	14,699·0	26·07	...

\* In these cases the average yield of the mild weather extends over one week before the first week in March, and another after the second week. There were changes in cows at the beginning of the fourth week in March, which prevented the yield of that week being included, as has been done with the other farms.

From the foregoing table it will be seen that the shrinkage in milk of this lot of cows, although not great, is still considerable, even although half of them had been kept at almost a uniform temperature. The results seem to indicate that cows kept constantly warm will suffer to some extent during such weather, while those kept freely ventilated will be affected but little, if at all, by any extremes of temperature usually met with in Scotland.

While both sets of cows have yielded on the average milk with a rather higher per cent of fat during the cold weather than when it was milder, still the difference is so trifling that it is not worth taking note of. It should, however, be noted that, either by accident or from the effects of the cold, there is slightly more fat in the milk when the temperature is low than when it was higher. The popular belief has generally been that cold had the effect of lowering the per cent of fat. During the cold snap at the beginning of the year, the fat in the milk of the cows in the freely ventilated byre was slightly lower than when the weather was warmer, while with the other lot it was the reverse.

#### *The Temperature of the Air of two sets of Byres.*

The intention was to have a difference of at least 10° F. between the air of the freely ventilated byres and the ones where the ventilation was restricted. On the average this was nearly attained, but on the farms where the cubic capacity allowed per cow was between 900 and 1100 cubic feet, the temperature could not be raised sufficiently to get quite 10° F. of difference even when every opening for ventilation was closed. In the case of Newton, where the cubic space was just about half of that at the other places, a difference of from 11° F. to 12° F. could always be maintained without difficulty.

The thermographs used gave complete satisfaction, caused no trouble, and have imparted a reliability to the experiment which could not have been attained without them.

As the number of cows was different on each farm, it was necessary in working out the average heat of the byres to take into account the number of cows under each temperature. It might have happened that the six cows at Rosslynlee had either very poor or very rich milk when stalled at any given temperature, while the eighteen at Newton might have had the reverse. If the numbers had not been taken into account in working out the averages, the six cows at Rosslynlee would have had the same effect in raising or lowering the quality as the eighteen cows at Newton. The same method of striking the averages has been adopted in connection with the per cent of fat.

THE FOLLOWING TABLE GIVES THE AVERAGE MONTHLY TEMPERATURE OF THE AIR OF EACH BYRE, AND THE AVERAGE TEMPERATURE OF ALL COMBINED FOR EACH MONTH. IN CALCULATING THE AVERAGE FOR THE MONTH, EFFECT HAS BEEN GIVEN TO THE NUMBER OF COWS AT EACH PARTICULAR TEMPERATURE.

Month.	Farm.	Free ventilation. Avg. deg. F.	Restricted ventilation. Avg. deg. F.	Monthly average of all.	
				Free.	Restricted.
November	Newton . .	*51.75	+62.95	...	...
	Woodilee . .	*53.10	+60.10	...	...
	Crichton . .	+51.20	+59.50	...	...
	Hartwood . .	+54.25	+58.75	...	...
	Average . .	...	...	52.41	60.78
December	Newton . .	48.83	60.78	...	...
	Woodilee . .	53.00	59.70	...	...
	Crichton . .	51.32	57.92	...	...
	Hartwood . .	49.10	58.02	...	...
	Average . .	...	...	50.28	59.51
January	Newton . .	48.85	59.45	...	...
	Woodilee . .	52.16	60.08	...	...
	Crichton . .	52.05	60.07	...	...
	Hartwood . .	47.17	55.90	...	...
	Rosslynlee . .	49.85	56.45	...	...
February	Average . .	...	...	49.90	58.90
	Newton . .	49.40	62.90	...	...
	Woodilee . .	52.18	62.77	...	...
	Crichton . .	50.10	61.55	...	...
	Hartwood . .	46.20	55.20	...	...
March	Rosslynlee . .	49.42	58.50	...	...
	Average . .	...	...	49.50	60.90
	Newton . .	48.52	59.05	...	...
	Woodilee . .	52.24	60.57	...	...
	Crichton . .	50.50	59.40	...	...
	Hartwood . .	47.87	56.00	...	...
	Rosslynlee . .	48.92	57.53	...	...
	Average . .	...	...	49.52	58.74
	Average for } the whole period }	...	...	49.82	59.40

\* For 3 weeks only.

† For 2 weeks only.

‡ For 1 week only.

The following tables (pp. 291, 292) give a summary of the milk yielded each week by all the cows on every farm.

On only two farms were any changes made in the cows during the whole continuance of the experiment, and when this was done, the one giving least was removed from each section and two others substituted giving about the same quantity of milk and about the same time calved. In an experiment of this kind it is inadvisable to change any greater number of animals than can be avoided, and the few changes that have been made add greatly to the reliability of the experiment. Unless on

## A SECTION.—FREE VENTILATION.

TOTAL YIELD OF MILK PER WEEK, AND AVERAGE PER DAY OF THE COWS AT EACH FARM.

For week beginning.	NEWTON.—18 cows.				WOODLEE.—10 cows.				CRICHTON.—8 cows.				HARTWOOD.—8 cows.				ROSSLYNKE.—6 cows.			
	Total milk of all cows in lb.	Milk daily per cow	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow	Average per cent of fat.	
Average per week of trial period	3,322.0	26.3	3.59		2,050.0	29.4	...		1,685.0	30.1	...		...	...	...	...	1,284.0	30.6	3.90	
November 22	3,311.0	26.3	3.48		2,196.0	31.4	3.40	...	1,600.0	28.6	3.65	...	*1,543.0	35.0	3.42	...	...	...	...	
" 29	3,239.5	25.7	3.41		2,031.2	29.0	3.37	...	1,595.5	28.5	3.63	...	2,081.0	36.2	3.40	...	...	...	...	
December 6	3,279.0	26.0	3.43		1,919.0	27.4	3.34	...	1,611.0	28.6	3.86	...	1,959.0	34.0	3.40	...	...	...	...	
" 13	3,316.0	26.3	3.55		1,897.0	27.1	3.38	...	1,626.5	29.0	...	...	1,984.0	35.4	3.20	...	...	...	...	
" 20	3,406.5	27.0	3.66		1,809.0	25.8	3.25	...	1,534.5	27.4	3.70	...	2,120.0	37.9	3.00	...	...	...	...	
" 27	3,526.5	28.0	3.66		1,784.0	25.5	3.34	...	1,459.5	26.1	3.62	...	2,083.0	36.3	3.12	...	...	...	...	
January 3	3,544.0	28.1	3.64		1,794.0	25.5	3.04	...	1,471.5	26.3	3.67	...	1,950.0	34.8	3.16	...	...	...	...	
" 10	3,548.0	28.1	3.52		1,756.7	25.5	3.40	...	1,461.5	26.1	3.56	...	1,932.0	34.5	3.01	1,851.0	32.2	4.02	...	
" 17	3,476.5	27.6	3.52		1,654.5	23.6	3.37	...	1,382.5	24.7	3.61	...	1,858.0	33.2	3.17	1,353.5	32.2	3.89	...	
" 24	3,521.0	27.9	3.61		1,582.0	22.6	3.51	...	1,415.0	25.3	3.70	...	1,787.0	31.9	3.27	1,334.0	31.7	3.75	...	
" 31	3,416.0	27.1	3.67		1,495.7	21.3	3.57	...	1,406.0	25.1	3.60	...	1,775.0	31.7	3.42	1,267.0	30.2	3.73	...	
February 7	3,435.0	27.3	3.59		1,662.2	23.8	3.50	...	1,348.0	24.1	3.47	...	1,756.0	31.3	3.29	+1,338.0	32.8	3.70	...	
" 14	3,428.0	27.8	3.64		1,663.0	23.8	3.46	...	1,296.0	23.0	3.65	...	1,725.0	30.8	3.27	1,265.0	30.1	3.64	...	
" 21	3,235.5	26.1	3.72		1,632.2	23.3	3.51	...	1,259.5	22.5	3.55	...	1,664.0	29.7	3.58	1,249.0	29.7	3.80	...	
" 28	3,246.0	25.8	3.86		1,553.0	22.2	3.40	...	1,245.0	22.2	3.60	...	1,628.0	29.1	3.64	1,167.0	27.8	3.90	...	
March 7	3,160.0	25.1	3.95		1,472.0	21.0	3.38	...	1,173.5	21.0	3.90	...	1,630.0	27.3	3.60	1,144.0	27.2	3.83	...	
" 14	3,177.5	25.2	3.93		1,349.7	19.3	3.40	...	1,240.5	22.1	3.52	...	+1,225.0	29.2	3.70	+997.5	28.0	3.98	...	
" 21	2,976.0	23.6	3.92		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Total .	60,302.5	26.6	3.65		29,242.7	24.6	3.38		25,811.0	27.0	3.66		30,500.0	32.5	3.33	12,466.0	30.2	3.82	...	
Average .	...	...	...		...	...	...		...	...	...		...	...	...	...	...	...	...	

\* For scarcely a full week.

† Change of cows.

‡ One or more cows withdrawn.

## B SECTION.—RESTRICTED VENTILATION.

TOTAL YIELD OF MILK PER WEEK, AND AVERAGE PER DAY OF THE COWS AT EACH FARM.

For week beginning.	NEWTON.—18 cows.				WOODLIFE.—10 cows.				CRICHTON.—8 cows.				HARTWOOD.—8 cows.				ROSSLYN.—6 cows.			
	Total milk of all cows in lb.	Milk daily per cow in lb.	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow in lb.	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow in lb.	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow in lb.	Average per cent of fat.		Total milk of all cows in lb.	Milk daily per cow in lb.	Average per cent of fat.	
Average per week of trial period	3,321.2	26.3	3.60	...	1,889.0	27.0	...	...	1,690.5	30.2	...	...	...	...	...	...	1,177.0	28.0	3.60	...
November 22	3,323.5	26.4	3.52	...	1,890.5	27.0	3.33	1,583.5	28.3	3.87	3.87	*1,478.0	33.6	3.70	...	...	...	...	...	...
" 29	3,270.5	25.9	3.42	1,890.5	27.0	3.33	1,633.0	29.2	3.98	3.98	3.98	1,983.0	35.4	3.60	...	...	...	...	...	...
December 6	3,316.0	26.2	3.43	1,949.0	27.8	3.21	1,633.0	29.2	3.86	3.86	3.86	1,983.0	35.4	3.60	...	...	...	...	...	...
" 13	3,348.0	26.5	3.55	1,987.7	28.4	3.23	1,646.0	29.2	3.86	3.86	3.86	1,983.0	35.4	3.60	...	...	...	...	...	...
" 20	3,403.6	27.0	3.56	1,969.0	28.1	3.23	1,604.0	28.6	3.80	3.80	3.80	2,060.0	36.8	3.20	...	...	...	...	...	...
" 27	3,496.0	27.7	3.58	1,841.0	26.3	3.35	1,535.5	27.4	3.80	3.80	3.80	2,078.0	37.1	3.15	...	...	...	...	...	...
January 3	3,495.0	27.7	3.52	1,783.0	25.5	3.38	1,474.5	26.3	3.66	3.66	3.66	1,977.0	35.3	3.00	...	...	...	...	...	...
" 10	3,527.5	28.0	3.50	1,702.0	24.9	3.11	1,450.5	26.4	3.67	3.67	3.67	1,950.0	34.9	3.16	...	...	...	...	...	...
" 17	3,378.0	26.8	3.54	1,624.2	23.2	3.27	1,455.5	26.0	3.57	3.57	3.57	1,954.0	34.8	3.22	...	...	1,164.0	27.7	3.60	...
" 24	3,442.0	27.3	3.44	1,626.2	23.2	3.25	1,399.5	25.0	3.52	3.52	3.52	1,952.0	34.8	3.48	...	...	1,054.0	25.1	3.50	...
" 31	3,330.0	26.5	3.41	1,643.0	23.5	3.38	1,435.0	25.6	3.50	3.50	3.50	1,887.0	33.7	3.48	...	...	1,017.5	24.2	3.50	...
February 7	3,351.0	26.6	3.52	1,585.7	22.8	3.31	1,432.5	25.6	3.50	3.50	3.50	1,881.0	32.7	3.55	...	...	1,161.0	27.8	3.35	...
" 14	3,303.0	26.4	3.52	1,688.2	24.3	3.30	1,324.0	22.9	3.46	3.46	3.46	1,869.0	33.4	3.54	...	...	1,209.5	28.8	3.30	...
" 21	3,125.5	24.8	3.66	1,645.0	23.5	3.16	1,280.5	22.9	3.31	3.31	3.31	1,847.0	33.0	3.34	...	...	1,221.5	29.1	3.30	...
" 28	3,148.0	24.9	3.67	1,624.0	23.2	3.24	1,264.5	22.6	3.45	3.45	3.45	1,836.0	32.8	3.64	...	...	1,158.0	27.6	3.40	...
March 7	2,989.5	23.7	3.82	1,593.0	22.3	3.11	1,268.0	22.6	3.30	3.30	3.30	1,797.0	32.1	3.68	...	...	1,138.5	27.1	3.38	...
" 14	3,067.0	24.3	3.82	1,505.5	21.5	3.28	1,245.0	22.2	3.47	3.47	3.47	1,780.0	31.8	3.60	...	...	1,095.0	26.1	3.26	...
" 21	2,856.5	22.7	3.86	1,344.0	19.2	3.31	1,303.5	23.3	3.42	3.42	3.42	1,352.0	32.2	3.71	...	...	1,066.5	27.0	3.36	...
Total . . .	59,150.6	26.1	3.59	29,011.5	24.4	3.27	26,055.5	27.4	3.58	3.58	3.58	31,627.0	33.7	3.44	...	...	11,185.5	27.1	3.43	...

\* For scarcely a full week.

† Change of cows.

‡ One or more cows withdrawn.

farms producing a large quantity of milk in winter, and having a considerable stock of cows to draw from, it is not possible to get two lots of cows sufficiently uniform and numerous, and likely to give a fairly full supply of milk all winter. In order to get accuracy, the number of cows on each farm should be as large as possible; the next best course being to increase the number of farms, even although the number of cows at each should have to be smaller. Experiments of this kind with a small number of cows run great risk of giving misleading results, owing to differences in the individual animals composing each section. With a large number of animals a degree of reliability may be attained which cannot be looked for from a small number, no matter with what care and skill they are selected and attended to. This is easily seen by referring to the following table, giving a summary of the yield of each set of animals at all the farms, where it will be found that had the experiment been confined to any of the farms having a small number of animals, very misleading conclusions might have been arrived at.

## SUMMARY.

FOR 18 WEEKS—FROM 22ND NOVEMBER 1908 TO 27TH MARCH 1909.

Farm.	No. of cows in each lot.	"A"—FREE VENTILATION.				"B"—RESTRICTED VENTILATION.			
		Total milk in lb.	Milk per cow per day in lb.	Average per cent of fat.	Average temperature of the byre.	Total milk in lb.	Milk per cow per day in lb.	Average per cent of fat.	Average temperature of the byre.
Newton .	18	60,302.5	26.6	3.65	49.35	59,453.6	26.1	3.59	60.81
Woodilee .	10	29,242.7	24.6	3.38	52.24	29,011.5	24.4	3.27	60.57
Crichton .	8	25,811.0	27.0	3.66	50.50	26,055.5	27.4	3.58	59.40
Hartwood .	8	30,500.0	32.5	3.33	47.87	31,627.0	33.7	3.44	56.00
*Rosslynlee	6	12,466.0	30.2	3.82	48.92	11,185.5	27.1	3.43	57.53
Total .	100	158,322.2	...	...	...	157,333.1	...	...	...
Average milk per cow per day for the whole period }			27.5	3.55	...	...	27.3	3.49	...
Difference . . . . .					...	989.1	.2	.06	...
Average temperature in proportion to the cows					49.82	...	...	...	59.40
Difference . . . . .					9.58	...	...	...	...

\* For 10 weeks only.

The animals in the freely ventilated byres have given almost 100 gallons more milk than the others. At first sight this seems a considerable quantity, but when it is remembered that it is an average of only 2 gallons per cow over a period of 18 weeks, it is seen to be really infinitesimal. It amounts to less than  $\frac{1}{4}$  lb. of milk per cow per day.

The average per cent of fat in the milk of each section of cows does not differ materially, and is as likely to be the result of individual differences in the animals as anything else. In the previous comparisons of the milk yielded by the animals during warm and cold periods, the animals did not differ, and therefore any increase or decrease in fat, no matter however slight, might reasonably be attributed to the conditions under which they were kept. That, however, does not apply when the two sections are compared, although the results point in the same direction as the others—viz., that milk produced in fresh air or at a lower temperature has a tendency to be higher in fat than where produced under bad ventilation or at a high temperature.

#### *The Health of the Animals.*

At the beginning of the experiment instructions were sent out that all cases of sickness of any kind should be reported each week. During the continuance of the experiment eight cases of weeds, mammitis, or inflammation of the udder have been reported as occurring among the cows of the B section. None of the cases of mammitis were of an infective nature, or were so serious as after recovery to interfere with the milk yield of the animals. There can, however, be little doubt that they were the result either of the high temperature in which the animals were kept, the vitiated air which they had to breathe, or the high percentage of moisture which was in the air of all the B byres, or of the combined influence of two or all of these factors. These cases occurred on four of the five farms, and roughly corresponded to the number of cows kept.

It is, however, worthy of being recorded that the only farm which escaped this trouble was the one which had the lowest average temperature, although there is little evidence to prove that the lowness of temperature should be credited with the freedom from weeds. It has been often remarked that when the cows are in the fields in summer time, cases of mammitis are far more prevalent after excessively hot days than after cold ones. Each case of mammitis generally meant that the cow affected had a reduced quantity of milk for about a week after. Each case caused a loss of from four to six gallons of milk, and as each affected cow was credited with the weight of milk which it was presumed she would have yielded had nothing been wrong with her, the B or restricted section are credited with at least 400 lb. of milk more than was actually produced.

Each section of cows had two slight cases of indigestion, all on separate farms, so that in this respect the two lots are alike.

*Humidity of the Air.*

Two dry and wet bulb thermometers were placed in each byre, over the middle of the centre walk, about  $6\frac{1}{2}$  to 7 feet above the floor. The readings of these were taken when the byres were entered in the morning, shortly after midday, and again some time after the byres were closed up at night. The following table gives the average readings, and the humidity of the air as kindly calculated by Mr Watt, the Secretary of the Scottish Meteorological Society, Edinburgh—

THE FOLLOWING TABLE GIVES THE AVERAGE READINGS OF THE WET AND DRY BULB THERMOMETERS FOR EACH BYRE FOR EACH MONTH, WITH THE HUMIDITY OF THE AIR AS ESTIMATED FROM THESE READINGS BY GLAISHER'S HYGROMETRICAL TABLES.

MONTH.	FARM.	FREE VENTILATION.			RESTRICTED VENTILATION.		
		Dry bulb.	Wet bulb.	Percent of humidity.	Dry bulb.	Wet bulb.	Percent of humidity.
November	Newton .	53·30	51·30	86	63·5	62·6	95
	Hartwood	53·84	52·49	89	59·4	58·1	93
	Average .	53·57	51·89	88	62·24	61·22	94
December	Newton .	49·88	48·16	88	60·67	59·38	92
	Hartwood	50·72	49·49	92	57·50	56·35	93
	Average .	50·30	48·82	90	59·08	57·86	92
January	Newton .	49·35	47·87	90	60·09	59·19	94
	Woodilee	51·41	49·75	90	62·47	60·92	91
	Crichton .	51·79	50·31	89	59·41	58·50	95
	Hartwood	51·43	50·37	93	58·57	57·45	94
	Rosslynlee	50·98	49·65	91	54·54	53·78	96
	Average .	...	...	90·6	...	...	94
February	Newton .	50·63	49·08	90	62·36	61·37	94
	Woodilee	51·56	49·20	84	63·20	61·00	87
	Crichton .	49·90	48·10	88	61·60	60·50	93
	Hartwood	48·34	47·40	94	57·21	56·21	93
	Rosslynlee	51·20	48·65	83	60·12	59·48	96
	Average .	...	...	87·8	...	...	92·6
March	Newton .	40·09	47·15	86	59·71	58·51	93
	Woodilee	50·42	48·07	85	62·40	59·85	85
	Crichton .	48·47	46·20	83	58·13	56·67	90
	Hartwood	47·33	46·07	92	54·80	53·80	94
	Rosslynlee	50·18	47·35	80	58·95	57·77	94
	Average .	...	...	85·2	...	...	91·2

## CONCLUSIONS.

The following are the conclusions which it would seem reasonable to draw from this experiment at this stage:—

1. That fresh air is a much more important factor in the production of milk in mid-winter than it is generally considered to be by milk-producers in this country. While most people agree to the need of fresh air in regard to the health of the animals, it seems almost as desirable in mid-winter if a full supply of good wholesome milk is to be produced.
2. In order that the greatest advantage may be derived from the fresh air, the animals should at no time have the ventilation restricted in autumn, but should be kept as cool as possible, so that they may not only retain all their hair, but if necessary increase it.
3. There is no difficulty, much less impossibility, in producing milk in freely ventilated byres in the coldest weather likely to be met with in this country, if the cows are freely ventilated and kept sufficiently cool in early autumn.
4. While the present experiment shows that rather more milk has been produced under conditions of free ventilation than where ventilation was restricted, it would be injudicious, till these results have been corroborated by other trials, to consider that this will invariably happen. It is unquestionable that the general health of the cows would be better under free than under restricted ventilation.
5. Milk produced in a building kept at a high temperature, or during a warm period, does not seem to be any richer in fat than that produced at a low temperature or during cold weather.
6. It seems hopeless to expect to be able to keep the air of any byre, no matter how the byre may be constructed, at from 60° F. to 63° F. during the ordinary weather of an average winter without excessive pollution of the air.
7. While the effect of a high or low temperature is probably felt by animals almost instantaneously, and very likely produces its results at once, we have little information indicating how long a cow may breathe a vitiated atmosphere before that effect shows itself on the animals or their production of milk. At Newton the influence seemed to show itself between the fourth and fifth week after the experiment began.

8. The great causes of variation in the fat in milk are—
  1. Irregularity in the hours of milking.
  2. The individuality of the cow.
  3. Want of perfection in milking.
9. Any saving in food which is effected by keeping the animals at a higher temperature is equalled, if not exceeded, by improved digestion when they have plenty of fresh air but a lower temperature.
10. There is reason for believing that those great scourges of the dairyman, mammitis or weeds and tuberculosis, may be reduced to a minimum if cows are kept in freely ventilated byres in winter.

A report on the amount of carbonic acid and bacteria and moulds in the air of the two sections of byres will appear in the next volume of the 'Transactions,' time not being available to prepare it for this volume. Information will also be given next year on how the different lots of cows thrive and yield on the pastures.

The most sincere thanks of the Society are due to all those who have assisted in carrying out this experiment. Not only are these thanks due to the various committees in charge of the asylum farms for having generously granted the use of their stock, but equally to the medical superintendents for supervising the whole, and the assistant doctors, farm managers, dairymen, and dairymaids for the careful way in which they did their share of the work, and the interest they showed in it. To many connected with the work the results have been a surprise; but as seeing is believing, and knowing as they did the conditions under which the results were obtained, they naturally were more impressed by the results than those who merely read about them are likely to be. It is therefore to be hoped that the co-operators in the work will benefit by the experience obtained, and will assist in spreading the information as widely as possible, for although all the results obtained should be ultimately proved to be correct, it will take years to convince the public that they are so.

[TABLES (*Giving Detailed Yields*)

**NEWTON.—AVERAGE YIELD PER COW PER WEEK. A SECTION.**

Week beginning	1		2		3		4		5		6	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Nov. 22, 1908	214.5	4.09	169.5	3.40	178.0	3.55	176.0	3.66	200.0	3.41	147.5	3.01
November 29	215.0	3.56	158.5	3.21	178.5	3.80	173.5	3.56	211.0	3.12	135.0	2.99
December 6	209.0	3.44	167.0	3.35	173.5	3.40	175.0	3.58	211.5	3.58	151.5	3.27
" 13	224.0	3.69	166.0	3.49	173.5	3.98	181.0	3.85	217.0	3.10	140.0	3.05
" 20	249.5	3.92	169.5	3.60	178.0	4.15	192.5	3.93	216.0	3.17	135.0	3.18
" 27	252.0	3.83	170.0	3.56	185.0	4.13	193.0	3.91	217.0	3.10	133.5	3.35
Jan. 3, 1909	266.5	3.95	172.0	3.55	201.0	4.11	202.0	3.76	209.0	3.27	140.5	3.10
January 10	272.0	3.66	178.0	3.53	196.0	4.08	199.0	3.78	207.5	3.16	188.5	3.09
" 17	245.0	3.99	172.0	3.45	188.5	3.73	201.5	3.87	203.5	3.21	138.5	3.13
" 24	241.0	4.23	177.0	3.79	199.0	3.45	204.5	3.87	190.5	3.31	139.5	3.37
" 31	242.0	4.31	176.0	3.58	196.5	3.76	198.5	3.75	187.0	3.43	130.0	3.29
February 7	238.5	4.18	178.5	3.61	198.5	3.83	198.0	3.67	189.5	3.25	138.5	3.20
" 14	236.0	4.20	183.5	3.71	199.5	3.89	200.5	3.84	179.5	3.36	136.5	3.37
" 21	239.0	4.31	177.0	3.84	201.0	3.83	193.0	3.90	170.0	3.47	133.5	3.38
" 28	230.0	4.39	184.5	3.88	193.5	4.01	188.5	4.02	158.0	3.58	134.0	3.41
March 7	219.5	4.50	172.5	4.07	193.0	3.98	182.0	4.03	148.0	3.76	133.0	3.70
" 14	226.0	4.57	176.0	4.38	202.0	4.12	187.5	4.16	152.0	3.88	123.0	3.74
" 21	205.0	4.61	170.5	4.17	170.0	4.33	180.5	4.25	141.5	3.71	127.0	3.69

	7		8		9		10		11		12	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Nov. 22, 1908	200.5	2.78	165.5	4.47	201.5	3.40	152.5	4.27	161.0	2.87	150.5	3.84
November 29	183.0	2.80	162.0	3.78	211.0	3.60	142.0	4.32	159.0	3.08	141.5	3.91
December 6	182.0	3.21	155.5	3.75	196.5	3.50	150.5	3.71	170.0	3.30	149.0	3.69
" 13	180.0	3.14	145.5	3.98	212.0	3.71	147.5	4.44	166.5	3.10	146.5	4.07
" 20	192.5	3.13	162.5	4.08	222.0	3.88	150.0	4.80	168.5	3.30	150.0	4.16
" 27	189.5	2.97	156.5	3.81	229.0	3.93	159.0	4.74	172.5	3.19	160.5	4.19
Jan. 3, 1909	197.0	3.03	164.0	3.85	224.5	3.67	159.5	4.73	174.0	3.29	165.0	4.10
January 10	198.0	3.05	167.5	3.73	223.0	3.70	156.0	4.81	163.5	3.11	167.0	4.08
" 17	193.5	2.96	172.5	3.78	214.0	3.73	156.0	4.33	159.5	2.98	164.5	4.11
" 24	191.5	3.08	172.5	3.70	223.5	3.58	151.5	4.82	171.0	3.12	170.5	4.18
" 31	192.0	3.05	167.5	3.88	215.5	3.73	154.5	4.68	166.5	3.38	171.0	4.12
February 7	182.5	3.08	166.0	3.80	209.0	3.75	155.5	4.53	169.5	3.11	170.5	4.17
" 14	181.5	2.99	170.0	3.73	212.0	3.84	152.5	4.64	160.0	3.23	170.0	4.29
" 21	178.5	3.17	165.0	3.90	204.5	3.55	154.0	4.39	157.0	3.29	166.0	4.14
" 28	174.5	3.17	166.0	3.94	201.0	3.78	152.0	4.83	154.5	3.37	157.5	4.06
March 7	176.0	3.33	165.0	3.82	192.5	3.94	153.0	4.72	157.0	3.46	160.5	3.92
" 14	170.5	3.56	159.5	3.97	195.0	3.87	150.0	4.77	150.5	3.57	165.5	3.96
" 21	158.5	3.44	147.0	3.79	183.5	3.82	147.5	4.65	136.0	3.56	158.0	3.95

	13		14		15		16		17		18	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Nov. 22, 1908	177.0	2.86	182.0	3.49	204.0	3.69	212.5	3.32	193.0	3.41	225.5	3.02
November 29	168.5	2.86	192.0	3.45	197.0	3.78	200.0	3.84	184.5	3.26	227.5	2.94
December 6	179.0	3.19	185.0	3.54	198.5	3.60	196.5	3.39	196.5	3.44	232.0	3.18
" 13	183.5	3.05	189.5	3.74	197.5	3.83	200.0	3.20	199.5	3.37	246.5	3.08
" 20	177.0	3.10	196.5	3.85	200.0	3.84	198.5	3.28	202.0	3.31	256.5	3.23
" 27	183.5	3.19	199.5	3.99	211.5	4.23	190.5	3.88	206.0	3.16	268.0	3.32
Jan. 3, 1909	180.0	3.41	202.5	3.58	207.5	4.35	203.0	3.13	201.0	3.33	270.5	3.36
January 10	176.5	2.86	203.5	3.68	212.5	3.72	205.5	3.13	200.5	3.08	233.5	3.22
" 17	178.5	2.70	206.5	3.63	206.5	4.03	199.0	3.09	201.5	3.23	280.5	3.34
" 24	174.5	3.02	202.0	3.78	212.5	3.97	205.0	3.17	203.0	3.26	292.0	3.39
" 31	168.0	2.98	200.0	3.93	198.0	4.04	202.5	3.16	164.0	3.65	236.5	3.38
February 7	171.5	3.03	206.5	3.57	190.5	3.90	208.0	3.28	188.5	3.42	230.5	3.34
" 14	169.0	3.11	202.0	3.48	197.0	4.13	203.5	3.13	190.5	3.39	235.0	3.31
" 21	158.0	3.33	196.0	3.87	186.5	4.41	168.5	3.40	177.0	3.52	276.0	3.36
" 28	150.5	3.44	191.0	3.99	182.5	4.28	177.0	3.54	179.5	3.46	271.5	3.37
March 7	151.5	3.47	186.5	3.92	168.0	4.23	169.5	3.52	174.0	3.52	259.5	3.33
" 14	144.0	3.54	198.5	3.83	166.0	4.30	173.0	3.57	170.5	3.59	268.0	3.49
" 21	127.5	3.54	183.5	4.02	160.5	4.41	169.0	3.57	171.5	3.60	244.0	3.51

**NEWTON.—AVERAGE YIELD PER COW PER WEEK. B SECTION.**

Week beginning	1		2		3		4		5		6	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Nov. 22, 1908	153.0	3.56	229.5	3.71	208.5	3.06	160.5	3.74	204.5	3.56	166.0	3.71
November 29	152.5	3.25	221.5	3.61	205.0	3.07	160.0	3.60	204.0	3.41	143.5	3.56
December 6	141.0	3.80	208.5	3.27	207.5	3.19	175.0	3.44	194.0	3.84	162.5	3.46
" 13	153.0	3.45	210.5	3.71	210.0	3.10	171.5	3.78	194.0	3.59	163.5	3.61
" 20	150.5	3.50	214.0	3.65	206.0	3.14	179.5	3.80	201.0	3.43	176.0	3.51
" 27	155.0	3.38	210.5	3.53	205.5	3.25	192.5	3.59	197.0	3.63	180.5	3.58
Jan. 3, 1909	158.0	3.27	208.0	3.70	197.5	3.23	184.5	3.82	193.5	3.69	173.0	3.46
January 10	155.0	3.40	212.0	3.64	198.5	3.23	188.5	3.68	200.5	3.66	182.5	3.23
" 17	151.0	3.28	204.0	3.25	137.5	3.62	186.5	3.76	192.0	3.69	179.5	3.38
" 24	163.5	3.10	196.5	3.53	175.0	3.08	198.5	3.70	200.5	3.58	185.5	3.27
" 31	162.0	3.44	194.0	3.49	174.5	3.39	194.0	3.80	185.5	3.90	180.0	3.45
February 7	161.0	3.28	201.0	3.36	175.0	3.37	207.5	3.82	187.5	3.75	180.5	3.23
" 14	153.0	3.35	187.0	3.46	154.0	3.36	206.0	3.75	187.0	3.87	181.5	3.41
" 21	139.0	3.57	182.0	3.68	158.0	3.53	153.5	4.43	184.0	3.94	175.0	3.45
" 28	131.5	3.55	183.0	3.59	150.0	3.18	166.0	3.88	183.5	4.20	167.0	3.43
March 7	121.5	3.67	155.0	4.43	141.5	3.42	164.0	4.13	178.0	4.27	159.5	3.65
" 14	111.5	3.63	167.5	3.81	144.0	3.60	171.0	4.33	186.5	4.32	165.0	3.66
" 21	89.5	3.77	166.5	3.79	135.5	3.68	173.5	4.18	177.5	4.31	159.0	3.68

	7		8		9		10		11		12	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Nov. 22, 1908	196.0	3.78	156.0	3.68	170.5	3.08	188.0	3.49	201.5	3.58	181.0	3.44
November 29	209.5	3.49	153.5	3.63	160.5	3.17	184.5	3.21	191.5	3.36	184.5	3.52
December 6	208.0	3.53	157.0	3.72	163.5	3.16	184.5	3.46	196.5	3.46	188.0	3.73
" 13	207.0	3.50	149.0	3.76	164.5	3.13	188.5	3.43	208.0	3.47	194.5	3.64
" 20	203.0	3.83	153.5	3.87	176.5	3.21	200.0	3.35	215.5	3.53	191.5	3.71
" 27	212.0	3.63	161.5	3.95	178.0	3.31	205.0	3.35	211.5	3.65	190.5	3.78
Jan. 3, 1909	212.5	3.26	155.5	3.91	181.5	3.37	217.0	3.31	217.5	3.48	199.0	3.63
January 10	214.0	3.35	153.0	3.87	198.5	3.39	221.5	3.40	219.0	3.38	202.0	3.85
" 17	208.0	3.56	155.0	3.97	195.0	3.51	208.5	3.28	218.5	3.61	200.5	3.68
" 24	206.0	3.40	155.5	3.78	189.5	3.34	223.0	3.32	211.5	3.54	198.5	3.70
" 31	180.0	3.53	152.5	3.97	184.0	3.53	211.5	3.39	206.5	3.61	194.0	4.11
February 7	199.0	3.40	151.0	3.95	143.0	4.02	225.0	3.40	185.0	3.30	197.0	3.63
" 14	197.5	3.31	157.5	3.95	187.0	3.31	224.5	3.24	142.0	3.48	193.5	3.90
" 21	194.5	3.39	145.5	3.98	186.0	3.59	217.5	3.57	145.5	3.58	150.5	3.96
" 28	199.5	3.31	155.0	4.70	187.0	3.41	212.0	3.31	133.0	3.78	182.0	4.60
March 7	189.5	3.63	148.5	4.25	180.5	3.40	213.5	3.34	123.0	3.98	173.5	4.04
" 14	192.5	3.51	157.5	4.33	184.0	3.62	212.0	3.57	117.0	3.66	174.0	4.07
" 21	177.5	3.41	144.5	4.37	168.5	3.71	202.0	3.57	96.5	4.20	164.5	4.16

	13		14		15		16		17		18	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
Nov. 22, 1908	166.5	3.72	201.5	3.45	189.0	3.89	179.5	3.12	146.5	3.48	224.5	3.25
November 29	178.0	3.43	205.0	3.44	185.0	3.63	177.0	3.31	155.0	3.62	220.0	3.18
December 6	182.0	3.28	202.0	3.50	182.0	3.53	183.5	3.31	157.5	3.69	223.0	3.45
" 13	189.5	3.41	205.5	3.71	173.5	3.69	180.0	3.65	164.0	3.98	221.5	3.13
" 20	188.5	3.35	207.0	3.63	182.0	3.66	149.1	3.61	177.5	3.81	232.5	3.46
" 27	189.5	3.42	209.5	3.83	181.5	3.93	184.5	3.37	192.0	3.80	230.0	3.54
Jan. 3, 1909	192.5	3.29	209.5	3.73	179.0	3.59	194.0	3.44	195.0	3.78	227.5	3.23
January 10	187.0	3.12	205.5	3.37	170.0	4.75	203.0	3.36	201.5	3.53	220.5	3.28
" 17	183.0	3.49	144.5	3.73	137.5	3.66	205.5	3.35	199.0	3.59	217.5	3.30
" 24	191.0	3.19	164.5	3.59	164.0	3.61	208.0	3.33	202.0	3.58	209.0	3.37
" 31	171.0	3.43	173.0	3.70	162.5	3.64	207.5	3.56	200.5	3.48	200.0	3.55
February 7	183.0	3.33	164.5	3.83	171.5	3.88	207.5	3.28	202.5	3.58	209.5	3.39
" 14	188.0	3.25	167.0	3.57	163.0	3.44	212.0	3.33	203.0	3.72	199.5	3.64
" 21	172.0	3.18	165.0	3.65	160.5	3.48	208.0	3.31	197.0	3.62	192.0	3.41
" 28	179.5	3.37	174.0	3.36	158.0	3.58	201.0	3.42	183.5	3.93	194.0	3.43
March 7	163.0	3.63	162.0	3.93	145.5	3.99	199.5	3.41	187.0	4.06	179.5	3.57
" 14	175.5	3.64	172.5	3.73	160.5	3.89	195.0	3.61	188.5	4.03	182.5	3.57
" 21	168.5	3.58	170.0	3.81	136.0	3.96	186.5	3.52	177.0	3.97	163.5	3.80

## WOODILEE.

## A SECTION. FREE VENTILATION.

AVERAGE YIELD OF MILK PER COW PER WEEK.

For week beginning		1		3		4		5		6		7		8		9		10	
		Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
Nov.	22, 1908	278.5	3.75	163.0	3.35	137.5	3.70	158.0	3.00	197.5	3.75	218.5	3.10	210.0	3.55	219.0	3.10	247.0	3.30
"	29	282.0	3.60	179.0	4.05	139.5	3.80	164.5	3.00	205.5	3.7	243.0	3.10	226.5	3.55	193.0	3.10	233.5	3.30
Dec	6	275.0	3.20	166.5	4.05	125.5	3.80	157.2	3.00	194.7	3.7	220.5	3.45	201.2	3.10	185.2	3.20	266.5	3.00
"	13	263.5	3.60	154.0	4.17	132.0	3.57	146.5	3.10	189.0	3.67	205.0	3.05	186.5	2.85	199.0	3.15	241.0	3.00
"	20	247.5	3.45	154.0	4.25	129.5	3.80	143.5	3.15	186.5	3.45	208.0	3.05	174.0	3.40	176.7	3.27	269.2	3.07
"	27	241.0	3.75	146.0	4.25	119.0	3.10	134.0	3.05	171.0	3.50	198.5	2.75	173.0	2.95	172.5	3.45	263.0	2.65
Jan.	3, 1909	240.5	3.05	137.5	3.80	123.5	3.40	135.0	3.00	183.0	3.40	192.0	3.10	166.0	2.95	161.5	2.95	257.0	2.95
"	10	283.0	3.10	148.0	3.90	124.5	2.90	130.0	2.90	184.0	3.40	193.7	2.75	170.0	2.85	156.5	2.90	257.5	2.70
"	17	236.0	3.60	147.5	4.20	117.0	3.00	133.5	2.92	184.0	3.75	202.0	3.15	169.0	3.02	129.5	3.50	266.5	3.10
"	24	266.0	3.75	145.0	4.30	113.5	3.35	129.0	2.90	174.0	3.95	174.5	3.22	158.0	3.10	125.0	3.82	237.0	2.25
"	31	227.5	3.77	145.0	4.25	67.7	4.40	125.0	2.95	179.2	3.85	166.2	3.05	154.0	3.05	124.0	3.40	243.0	3.00
Feb.	7	221.5	3.92	137.0	4.35	44.2	4.25	128.0	2.95	166.0	3.90	167.5	3.12	137.5	3.35	110.0	3.45	229.5	2.95
"	14	224.0	3.20	150.5	4.25	187.0	3.45	119.2	3.00	150.7	4.05	173.5	3.10	135.0	3.70	120.5	3.50	233.5	3.10
"	21	221.5	3.60	146.5	4.30	208.5	3.32	117.0	2.97	161.0	4.00	183.0	2.95	136.0	3.60	117.0	3.25	226.5	2.87
"	28	216.0	3.90	141.0	4.30	201.0	3.50	116.0	2.95	154.5	3.85	180.0	3.12	137.2	3.62	106.0	3.20	221.9	2.97
March	7	199.5	4.00	142.7	3.65	152.7	3.95	105.5	2.75	136.0	4.00	183.0	3.12	133.0	3.50	94.5	3.15	204.5	2.95
"	14	179.0	4.00	146.5	3.40	135.0	4.15	98.5	2.82	129.5	3.70	175.5	2.30	134.0	3.25	88.5	3.05	192.0	3.10
"	21	166.0	3.70	139.5	3.25	185.5	3.40	91.2	3.05	100.0	4.10	163.2	2.90	126.7	3.15	76.5	3.30	173.0	3.20

OODILEE.

**B SECTION, RESTRICTED NTILATION:**

ERAGE ELDT OF MILK PER COW PER WE

For week	inning	2			5			8			9			0		
		Milk.	Fat.	%	Milk.	Fat.	%	Milk.	Fat.	%	Milk.	Fat.	%	Milk.	Fat.	%
Nov. 22	1908	lb. 252-0	% ...	...	lb. 162-5	% ...	...	lb. 160-5	% ...	...	lb. 167-5	% ...	...	lb. 123-0	% ...	...
" 29	"	259-0	3-30	3-40	181-5	3-30	3-40	144-5	3-35	3-40	169-5	2-80	3-55	190-0	3-35	184-5
Dec. 6	"	242-7	3-00	3-05	169-5	3-25	3-25	189-0	3-35	3-30	167-0	3-30	3-20	196-0	3-65	206-0
" 13	"	197-5	4-00	3-15	182-0	3-47	3-47	233-5	3-20	3-10	169-3	3-10	3-10	186-0	3-85	184-5
" 20	"	181-2	3-70	3-10	182-5	3-12	3-12	231-0	3-40	3-15	169-2	3-20	2-90	183-5	3-70	189-7
" 27	"	201-0	3-80	2-80	179-5	3-25	3-25	212-0	3-50	3-10	169-0	3-70	2-75	161-7	3-55	171-2
Jan. 3	1909	196-2	3-60	2-95	177-5	3-20	3-20	190-0	3-90	3-25	137-0	3-40	3-90	186-7	3-70	174-2
" 10	"	193-7	3-25	2-85	175-7	3-15	3-15	150-0	3-60	3-25	141-6	3-10	2-95	142-0	3-35	168-0
" 17	"	203-2	3-45	3-20	169-7	3-25	3-25	167-7	3-40	3-20	125-5	3-65	2-80	127-2	3-70	161-2
" 24	"	199-5	3-55	2-50	170-7	3-20	3-20	171-0	3-75	3-45	131-2	3-45	3-00	127-2	3-60	164-2
" 31	"	207-5	3-55	2-50	160-2	3-20	3-20	160-2	3-20	3-20	164-2	3-20	3-20	160-2	3-60	164-2
Feb. 7	"	203-2	3-72	2-72	166-0	3-20	3-20	166-0	3-20	3-20	164-2	3-20	3-20	166-0	3-60	164-2
" 14	"	211-0	3-60	2-35	172-5	3-30	3-30	171-7	3-50	3-50	126-7	3-47	3-00	122-5	3-35	177-7
" 21	"	221-0	3-50	2-50	178-5	3-20	3-20	168-5	3-22	3-40	124-2	3-10	3-00	122-5	3-35	177-7
" 28	"	216-5	3-40	2-45	158-5	3-35	3-35	161-0	3-60	3-05	115-2	3-57	3-02	228-0	3-00	179-0
March 7	"	215-5	3-45	2-32	148-5	3-70	3-70	154-5	3-17	3-10	117-0	3-17	2-95	227-5	2-95	174-2
" 14	"	207-5	3-45	2-70	144-7	3-30	3-30	155-5	3-35	3-25	105-5	3-45	3-00	224-5	3-02	162-2
" 21	"	181-2	3-75	2-70	116-7	3-45	3-45	141-2	3-35	3-40	106-2	3-75	2-85	195-7	3-25	139-5

## CRICHTON INSTITUTION.

## A SECTION. FREE VENTILATION.

AVERAGE YIELD OF MILK PER COW PER W<sub>1</sub>

For week beginning	1		2		3		4		5		6		7		8	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
November 22, 1908	lb. 211.0	% 3.60	lb. 202.5	% 3.80	lb. 205.5	% 3.20	lb. 227.0	% 4.10	lb. 236.0	% 3.50	lb. 155.5	% 3.60	lb. 164.0	% 3.70	lb. 283.5	% 3.7
" 29 "	190.0	3.50	188.0	3.00	205.5	5.00	210.5	4.50	222.5	3.20	169.5	3.50	161.5	3.40	253.0	3.7
December 6 "	189.5	4.80	194.0	3.50	198.5	3.78	208.0	3.60	223.0	3.50	153.0	4.90	166.5	3.40	263.0	3.0
" 13 "	189.5	3.70	199.5	3.45	195.0	4.10	200.0	3.45	221.0	3.50	150.5	4.00	172.5	3.90	283.0	3.5
" 20 "	190.5	4.50	188.0	3.50	182.5	3.50	187.5	3.40	194.0	4.70	154.0	3.60	177.0	4.00	290.5	4.16
" 27 "	180.5	4.20	185.0	3.80	175.0	3.50	178.5	3.00	195.0	3.80	150.5	3.60	157.5	4.20	271.0	3.5
January 3, 1909	187.5	4.00	188.0	3.60	182.5	3.50	178.0	3.20	178.5	3.50	152.0	4.00	159.5	4.20	250.5	3.4
" 10 "	180.5	4.20	188.0	3.60	188.0	3.20	175.0	3.00	177.5	3.80	152.0	4.20	158.5	3.60	257.0	3.5
" 17 "	168.5	4.20	187.0	3.80	172.0	3.50	167.5	3.20	176.0	3.40	148.0	4.30	148.0	3.50	231.0	3.0
" 24 "	163.0	4.30	181.0	3.70	172.5	3.50	171.5	3.20	180.5	3.30	144.5	4.30	154.5	4.10	246.0	3.2
February 7 "	164.0	4.20	176.5	4.00	175.5	3.50	168.5	3.20	169.5	3.50	151.5	3.80	155.0	3.70	246.0	3.0
" 14 "	167.5	4.30	163.5	3.80	169.0	3.00	156.0	3.10	159.5	3.50	149.0	3.80	154.0	3.50	239.5	3.3
" 21 "	153.4	4.00	168.0	3.60	158.5	3.50	149.5	3.00	147.0	3.60	142.5	4.20	152.5	3.80	235.0	3.5
" 28 "	146.5	4.00	152.5	4.00	156.5	3.60	147.5	3.00	140.0	3.20	138.5	3.70	150.5	3.40	227.5	3.5
March 7 "	142.5	3.80	149.5	4.00	155.0	3.30	143.5	3.20	142.0	3.60	138.0	4.40	149.5	3.80	225.0	3.3
" 14 "	130.5	4.40	143.5	3.80	143.5	3.60	143.5	3.10	125.0	4.00	130.5	4.60	141.0	4.20	211.0	3.5
" 21 "	134.5	3.90	160.5	3.50	158.0	3.20	145.5	3.10	135.5	3.20	143.0	4.20	143.5	4.00	220.0	3.1

## CRICHTON INSTITUTION.

## B SECTION. RESTRICTED VENTILATION.

AVERAGE YIELD OF MILK PER COW PER WEEK.

For week beginning	1		2		3		4		5		6		7		8	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
November 22, 1908	lb. 178.5	% ...	lb. 197.0	% 4.20	lb. 237.5	% 4.9	lb. 214.5	% 3.00	lb. 254.5	% 4.10	lb. 172.0	% 3.90	lb. 181.0	% 4.10	lb. 255.5	% 3.20
" 29 "	162.5	3.60	187.5	3.60	226.5	4.7	170.5	3.00	243.0	4.10	159.5	3.90	178.0	4.10	256.0	3.20
December 6 "	163.5	4.00	190.0	3.60	222.0	4.7	184.5	3.00	257.0	5.00	172.0	3.00	180.0	3.50	264.0	5.10
" 13 "	162.0	3.90	189.5	4.00	225.5	4.1	196.5	3.50	257.0	4.70	172.5	3.70	181.5	3.50	261.5	3.65
" 20 "	162.5	3.50	189.5	3.35	220.0	3.40	178.0	3.35	256.0	4.05	173.5	4.30	175.0	4.50	250.5	3.65
" 27 "	165.5	3.50	172.5	4.40	208.0	3.50	169.5	3.50	256.0	3.00	166.5	3.60	176.0	3.70	232.5	4.90
January 3, 1909	151.5	4.20	167.5	3.70	203.5	3.60	162.5	3.50	244.0	3.20	156.5	4.00	168.5	3.60	220.5	3.50
" 10 "	155.0	4.20	174.0	3.00	189.5	3.60	166.0	3.40	251.0	3.20	152.0	4.00	175.0	4.00	218.0	3.90
" 17 "	148.0	4.00	173.5	3.70	183.5	3.40	168.0	3.20	247.0	3.00	153.5	3.70	175.0	4.00	213.0	3.50
" 24 "	141.0	4.20	165.5	3.80	179.5	3.30	166.0	3.20	233.0	3.80	147.5	3.50	168.0	3.60	199.0	3.30
" 31 "	141.0	4.30	166.5	3.60	182.0	3.30	175.5	3.00	245.0	3.00	147.5	3.20	166.0	4.00	211.5	3.80
February 7 "	137.0	4.30	167.5	3.70	187.0	3.20	178.0	3.00	245.0	3.00	146.5	3.20	169.5	3.60	202.0	3.50
" 14 "	124.0	4.10	162.5	3.40	175.5	3.20	127.0	3.50	238.5	3.00	140.0	3.30	155.5	3.60	185.0	3.60
" 21 "	125.5	3.30	156.0	3.50	172.5	3.00	124.0	2.90	234.0	3.00	138.0	3.60	146.5	3.90	184.0	3.80
" 28 "	121.0	4.30	156.5	3.70	170.5	3.10	129.0	3.10	223.0	3.10	136.0	3.40	152.0	3.90	175.0	3.80
March 7 "	115.0	3.90	156.0	3.40	162.5	3.10	147.0	3.00	224.5	4.00	133.5	3.60	152.5	3.00	178.5	3.20
" 14 "	111.5	4.00	150.0	3.60	159.0	3.10	155.0	3.00	221.5	3.00	129.0	3.70	150.5	3.80	168.5	3.60
" 21 "	110.0	3.90	156.5	3.40	164.5	3.00	168.0	3.00	236.0	3.00	135.0	3.90	160.0	3.70	173.5	3.50

## HARTWOOD.

## A SECTION. FREE VENTILATION.

AVERAGE YIELD OF MILK PER COW PER WEEK.

For week beginning		1		2		3		4		5		6		7		8	
		Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
		lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%	lb.	%
November 30, 1908	.	147	3.5	219	3.5	181	3.1	180	3.4	190	4.2	191	3.0	249	3.1	186	3.6
December 6 "	.	202	3.2	258	3.5	224	3.6	258	3.1	294	3.8	204	3.7	304	2.8	287	3.5
" 13 "	.	194	3.5	245	3.9	200	3.4	270	3.2	272	3.2	209	3.2	292	2.5	277	3.2
" 20 "	.	244	3.4	240	4.0	195	3.5	256	2.9	282	2.8	195	3.4	290	2.5	279	3.1
" 27 "	.	278	2.7	242	3.3	221	3.3	279	3.1	296	3.0	202	3.1	306	2.4	290	3.0
January 3, 1909	.	272	3.3	239	3.3	218	3.5	257	3.0	274	3.0	202	3.1	280	2.5	291	3.3
" 10 "	.	262	3.1	244	3.8	202	3.2	255	2.7	250	3.0	189	3.0	276	2.8	252	2.8
" 17 "	.	264	2.8	227	3.7	207	3.1	239	2.7	261	2.7	195	3.4	268	2.8	271	2.9
" 24 "	.	261	3.2	226	3.1	206	3.2	216	3.0	259	3.0	178	3.3	260	2.5	252	3.2
" 31 "	.	260	3.3	221	3.5	193	3.8	206	2.7	244	3.1	167	3.4	245	2.9	251	3.5
February 7 "	.	258	3.5	214	3.4	185	3.7	203	3.2	245	3.6	171	3.7	253	3.1	246	3.4
" 14 "	.	262	3.5	215	3.1	182	3.2	191	3.1	240	3.2	161	3.6	248	3.2	257	3.4
" 21 "	.	254	3.5	219	3.2	178	3.5	185	2.8	233	2.9	153	3.4	250	3.0	248	3.9
" 28 "	.	248	3.4	210	3.5	176	3.7	156	3.6	232	3.3	154	4.0	247	3.5	241	3.6
March 7 "	.	258	3.5	205	3.6	180	3.7	152	3.5	211	3.4	148	4.1	237	3.5	237	3.8
" 14 "	.	253	3.7	204	3.4	171	3.8	106	3.6	206	3.5	137	3.9	228	3.6	225	3.8
" 21 "	.	245	3.7	187	3.6	158	3.8	...	...	192	3.7	...	...	223	3.6	220	3.8

HARTWOOD.  
B SECTION. RESTRICTED VENTILATION.  
AVERAGE YIELD OF MILK PER COW PER WEEK.

For week beginning	1		2		3		4		5		6		7		8	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
November 30, 1908	lb. 186	% 3.7	lb. 178	% 3.9	lb. 224	% 3.9	lb. 199	% 3.4	lb. 160	% 4.0	lb. 191	% ...	lb. 163	% 3.6	lb. 177	% 3.5
December 6 "	264	3.1	237	3.9	265	3.2	255	3.6	239	3.6	258	3.0	240	3.8	225	3.7
" 13 "	268	2.6	234	4.0	280	3.3	255	3.4	228	3.5	265	3.0	236	3.2	250	3.3
" 20 "	272	2.7	248	3.8	275	3.1	257	3.5	239	3.5	263	2.9	237	2.8	269	3.2
" 27 "	275	2.8	260	3.5	259	2.8	260	3.4	230	3.7	273	2.7	245	3.0	276	3.3
January 3, 1909	265	2.7	248	3.5	247	2.8	245	3.3	224	3.2	254	2.8	235	3.2	259	2.5
" 10 "	263	3.0	246	3.3	239	3.0	240	3.4	219	3.4	263	3.0	231	3.0	249	3.2
" 17 "	273	2.8	249	3.6	286	3.2	236	3.5	211	3.3	261	3.0	230	3.1	258	3.3
" 24 "	253	3.3	229	4.0	292	3.8	248	3.6	201	3.7	259	2.9	224	3.3	246	3.2
" 31 "	246	3.4	220	3.9	301	3.8	236	3.7	196	3.5	238	3.4	215	3.3	235	3.3
February 7 "	224	3.3	217	4.1	306	3.3	239	3.9	188	3.9	231	3.4	220	3.2	220	3.3
" 14 "	209	3.5	227	4.1	306	3.2	244	3.4	195	4.0	240	3.2	219	3.5	229	3.4
" 21 "	220	3.4	234	3.8	301	2.9	228	3.5	190	3.9	233	3.1	212	3.3	239	2.8
" 28 "	230	3.4	225	3.9	288	3.5	223	3.7	177	3.9	242	3.3	211	3.6	230	3.8
March 7 "	227	3.5	225	3.6	235	3.4	222	3.6	176	3.7	227	3.4	218	3.7	217	3.7
" 14 "	223	3.4	217	3.9	275	3.4	227	3.5	173	3.6	234	3.5	214	3.6	217	3.8
" 21 "	227	3.5	211	3.9	263	3.7	214	3.8	...	.	229	3.4	...	...	208	4.0

## ROSSLYNLEE.

## A SECTION. FREE VENTILATION.

## AVERAGE YIELD OF MILK PER COW PER WEEK.

For week beginning	1		2		3		4		5		6	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
Jan. 10, 1909 } Preliminary }	lb. 186.0	% 3.8	lb. 239.0	% 3.6	lb. 265.0	% ...	lb. 150.0	% 3.70	lb. 277.0	% 4.9	lb. 167.0	% 4.1
Jan. 17, 1909	194.5	3.4	240.0	3.4	318.0	4.1	140.5	3.70	284.5	5.0	173.5	4.3
" 24 "	193.0	3.3	237.0	3.5	329.5	3.9	139.5	3.70	284.5	4.0	170.0	4.0
" 31 "	198.0	3.3	235.5	3.4	340.0	3.8	136.5	3.90	269.0	4.6	155.0	3.6
Feb. 7 "	198.0	3.6	224.5	3.45	338.0	3.7	132.0	3.80	230.0	4.3	144.5	3.95
" 14 "	196.5	3.4	224.0	3.60	350.0	3.1	123.0	3.70	301.5	4.3	143.0	4.3
" 21 "	190.0	3.7	217.0	3.50	345.0	3.4	119.0	3.50	270.0	4.2	124.0	4.5
" 28 "	187.0	3.5	213.0	3.80	348.0	3.5	96.0	4.00	291.0	3.7	111.0	4.3
Mar. 7 "	184.0	3.5	206.0	3.70	315.5	3.6	69.0	4.15	292.0	3.9	100.5	4.5
" 14 "	182.5	3.7	207.5	4.00	323.5	3.3	52.0	3.90	291.5	3.6	87.0	4.5
" 21 "	172.0	3.6	192.5	3.90	293.5	3.6	..	..	275.0	3.9	64.5	4.9

## B SECTION. RESTRICTED VENTILATION.

Jan. 10, 1909 } Preliminary }	219.0	3.50	153.0	3.0	246.0	3.2	246.5	3.4	103.0	4.3	209.5	4.6
Jan. 17, 1909	245.5	3.40	148.0	3.1	195.0	3.7	253.5	3.4	87.5	4.5	198.5	3.5
" 24 "	214.0	3.50	149.0	3.1	167.0	3.8	241.5	3.4	71.0	4.6	212.0	3.5
" 31 "	209.0	3.70	145.5	4.0	174.0	3.8	236.0	3.6	52.0	4.7	201.0	3.8
Feb. 7 "	200.5	3.50	140.0	3.0	187.0	3.7	226.0	3.3	*210.0	3.8	197.5	3.4
" 14 "	204.5	3.50	137.0	3.0	192.0	3.2	240.5	3.2	236.0	3.3	199.5	3.4
" 21 "	208.0	3.40	134.5	3.1	194.0	3.2	233.5	3.5	252.5	3.3	199.0	3.4
" 28 "	196.0	3.40	122.0	3.3	187.0	3.4	220.0	3.8	245.0	3.2	188.0	3.4
Mar. 7 "	197.0	3.50	113.0	3.1	178.5	3.5	217.0	3.3	239.5	3.4	193.5	3.5
" 14 "	192.5	3.50	95.0	3.0	184.0	3.0	213.0	3.4	222.5	3.2	188.0	3.45
" 21 "	184.0	3.40	...	...	172.5	3.4	202.0	3.4	226.5	3.0	181.5	3.60

\* New cow.

## ANALYSES FOR MEMBERS DURING 1908.

By JAMES HENDRICK, B.Sc., F.I.C., Chemist to the Society.

THERE was a considerable diminution in the number of samples submitted during 1908 as compared with the preceding three years. The diminution was due to the fact that the number of fertilisers received during the spring months was smaller than usual.

The numbers of feeding stuffs and of miscellaneous samples are about as usual.

The diminution in fertilisers may be due to the action of the new Fertilisers and Feeding Stuffs Act, but is more probably due to the nature of the weather in the spring. Manure samples did not begin to reach me till considerably later than usual, as the cold wet weather lasted until late in spring. When the weather did improve sufficiently to allow field work to be proceeded with, there was such a rush that probably there were some who had less time than usual to think of having their manures analysed.

The total number of samples received during the year was 135. Of these, 68 were fertilisers, 28 feeding stuffs, and 39 miscellaneous samples, including waters, milks, soils, poisons, &c.

Though in a great many cases the members who submit samples do not return any information to show whether the results of the analysis agree with the guarantee or not, in a number of cases where information was given, samples were found to be not up to guarantee in one or more constituents. Further, a number of samples which were up to the formal guarantees of constituents given in the invoice were found to be more or less seriously adulterated. All these cases were in due course reported to the directors.

In some cases the members concerned reported that they had taken steps to recover compensation from the sellers, but in the majority of cases no further information was furnished. It is to be presumed that the purchasers were able to obtain satisfaction from the sellers, as they did not accept the offer of further aid from the Society.

## FERTILISERS.

In my report on analyses made during 1907 ('Transactions,' 1908, p. 267) it was pointed out that faked or imitation bone-meals were not uncommon. During 1908 such samples again

appeared to be common. The following table gives the analyses of three samples, all of which were sent to me as bone-meal:—

#### FAKED BONE-MEALS.

	I.	II.	III.
	per cent.	per cent.	per cent.
Moisture . . . .	8.38	5.50	5.83
Organic matter . . . .	42.70	44.69	60.45
Phosphate of lime . . . .	41.61	43.73	24.63
Carbonate of lime . . . .	4.75	4.34	1.10
Alkaline salts, &c. . . .	1.67	1.49	4.62
Siliceous (sandy) matter . . . .	0.89	0.25	3.37
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00
Containing nitrogen . . . .	5.76	4.36	7.56
Equal to ammonia . . . .	6.99	5.28	9.18

No. I. contained much horn and hair mixed with the bone, and is therefore high in nitrogen but low in phosphates. It consists of what is sometimes known as "reinforced bone."

No. II. did not even resemble bone-meal. It was a mixture of some kind of treated bone, with fleshy nitrogenous matter.

No. III. was really a mixture of bone- and meat-meals, and contains not more than 50 per cent of bone-meal. On correspondence with the purchaser it was discovered that the sample was sold and invoiced as bone meat-meal. So long as these articles are sold and invoiced as what they are no harm is done, as they are all valuable manures, which fetch a fair price per unit of nitrogen and phosphate.

Samples of the cheap low-grade muriate of potash, which is commonly known as potash manure salt, still continue to be sent to me as sulphate of potash. Potash salt, or potash manure salt, contains practically no sulphate of potash, and should not be sold as sulphate of potash.

#### *Ground Lime.*

The number of samples of ground lime received was not so great as in previous years, but the quality of the samples was distinctly better. No samples were received containing under 50 per cent of caustic lime, and only two contained under 60 per cent. On the other hand, two samples of excellent quality were received, each of which contained over 80 per cent of caustic lime. The best contained 83.2 per cent. A good sample of ground lime should contain at least 70 per cent of caustic lime.

### FEEDING STUFFS.

Among the feeding stuffs submitted was a sample of linseed cake which was not only below the guarantee in oil, but was very impure. It contained both rape and weed seeds. It was sold as a "95 per cent" linseed cake. This term 95 per cent linseed cake is an objectionable one, and purchasers should refuse to accept it. If a cake is sold as "linseed cake" it is required by the Fertilisers and Feeding Stuffs Act to be entirely linseed cake—that is to say, pure linseed cake in the ordinary acceptation of the term. We cannot expect a linseed cake to be absolutely free from any particle of foreign material, but it should not have 5 per cent or any other quantity of foreign material mixed with it, and the linseed from which it is prepared should be properly screened and cleaned. An admixture of 5 per cent of weed seeds or sand might render the cake worthless, or even dangerous.

### *Arsenic in Manures.*

Among the miscellaneous samples were three of manure which were sent in to be examined for arsenic, as it was feared that fowls were being poisoned by picking over the fields to which these manures had been applied in dry weather. Distinct traces of arsenic were found in two of the manures—a superphosphate and a sulphate of ammonia.

The crude vitriol (sulphuric acid) which is used in preparing such manures as superphosphate and sulphate of ammonia generally contains arsenic, sometimes in considerable quantity. It was from the use of such vitriol in preparing brewing sugars that a bad outbreak of arsenic poisoning was caused a few years ago among consumers of the beer prepared from such sugars. It is to be expected that superphosphate and other dissolved manures, and, to a less extent, sulphate of ammonia, will contain arsenic. Superphosphate frequently contains a considerable amount of arsenic. No doubt, therefore, fowls and other animals might be poisoned if they picked up and swallowed a quantity of such manure. It is not likely, however, that this would be a serious source of danger to animals in ordinary circumstances. It has been shown by experiment also that the arsenic does not pass into the plants grown by the help of such manures, so that there is no danger of stock or human beings being poisoned by consuming crops grown by the aid of such arsenic contaminated manures.

## THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1908, AND THE WEATHER OF SCOTLAND IN 1908.

### THE CROPS.

THE following comparison of the cereal and other crops of 1908 with those of the previous year has been prepared by the Secretary of the Society from answers to queries sent to leading agriculturists in different parts of the country.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with last year, of the following crops? The quantity of each crop to be stated in bushels. What quantity of seed is generally sown per acre?—(1) Wheat, (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards ryegrass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow-hay crop more or less productive than last year?
5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease? and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality, as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braid? Was more than one sowing required? and why?
7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?
11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following notes and statistics have been compiled:—

**EDINBURGSHIRE.** *Wheat*—40 bushels; straw about the same as last year; 3½ bushels sown. *Barley*—44 bushels; straw about the same as last year; 3 bushels seed sown. *Oats*—46 to 52 bushels; straw about the same as last year; 4 bushels seed sown. *Harvest* commenced about the end of August and finished 30th September, five weeks or so; got some bad weather, but nothing spoiled; great difference from last year, when the harvest lasted eleven weeks. *Hay*—About 2 tons 10 cwt., or about the same as last year; fine got, and sold off the rick 5s. dearer than last year of £3, 10s.; now selling at £4, 10s.; second crop fine got and a good crop, selling about £3 to £3, 10s. *Meadow-hay*—Very little grown, crop about the same as last year. *Potatoes*—Good crop; about 8 tons; no disease; keeping fine in pits; selling from 35s. to 50s.; nearly the half of last year, and the crop not much better. *Turnips*—Very good crop; 25 to 30 tons; no shooting this year. *Mangold*—A fine crop; superior to last year; about 25 tons. No injury by insects or by weeds. *Live Stock*—Pastures very good; fully better than last year; both cattle and sheep thrive well, and were quite free from disease. *Clip of wool*—About the same as last year.

**LINLITHGOWSHIRE.** *Wheat*—48 bushels; 1½ ton straw; 4 bushels sown. *Barley*—48 bushels; 1½ ton straw; 3 to 4 bushels seed. *Oats*—56 bushels; 1½ ton straw; 4 to 6 bushels sown. *Harvest*—About the average time. *Hay*—About 2 tons; early cut; good quality. *Potatoes*—Say 7 tons ware; 1½ ton seeds; very little disease. *Turnips*—From 20 to 25 tons; quality good; slow braird; little second sowing. No injury by insects or by weeds. *Live Stock*—Pastures during the season of average growth and quality with last year; stock did well; cattle and sheep free from disease.

**HADDINGTONSHIRE (Upper District).** *Wheat*—None grown. *Barley*—30 to 32 bushels; quality of grain and straw better than last year; 3 bushels sown. *Oats*—38 to 40 bushels; quality of grain and straw better than last year; 4 bushels sown. *Harvest* began three weeks earlier than last year. *Hay*—2 tons of good quality. *Meadow-hay*—Less productive. *Potatoes*—5½ to 6 tons; no disease; no new varieties planted. *Turnips*—19 to 20 tons; quality better than last year; crop brairded well; only one sowing. No injury by insects; crop not injured by weeds to a great extent; some fields of oats suffered from excess of "runchea." *Live Stock*—Pastures during the season of average growth and quality with last year; stock thrive very well and were free from disease. *Clip of wool*—About an average.

**HADDINGTONSHIRE (Lower District).** *Wheat*—40 bushels; quality good; fair bulk of straw; seed sown, 3 bushels drilled or 3½ to 4 bushels broadcast. *Barley*—40 to 48 bushels; quality very good where it escaped the bad weather at harvest, otherwise discoloured; fair bulk of straw, but yield of barley per acre rather disappointing; seed sown, 2½ to 3 bushels drilled. *Oats*—44 to 52 bushels; quality good, except some which were hurt by bad weather; fair bulk of straw; seed sown, 3½ to 4½ bushels, according to variety, drilled. *Harvest* began about average time, 20th August. *Hay*—A fair, not quite average; from 1½ ton (on dry land) to 2½ tons; quality good and well secured; no meadow-hay grown. *Potatoes*—"Up-to-Dates" or similar varieties, 6 to 9 tons; "Langworthies," 5 to 8 tons; no disease; good quality, but bad prices; a few "Golden Wonders" and other new varieties planted, but crop

grown principally "Up-to-Dates," and in some cases "Langworthies." *Turnips*—16 to 28 tons; not so heavy a crop as last year; dry weather in early summer and mildew in October prejudicially affected the crop; early-sown swedes did best, later ones braided irregularly and some resowing required. Not much damage; slugs eat over a few young turnips after singling, but sparrows do a great amount of damage to grain crops at and before harvest; not much damage by weeds, but some fields affected with charlock. *Live Stock*—Pastures rather bare in early summer, but grass unusually plentiful in the back end; stock thrive well in summer, but inclined to scour on the later grass; cattle and sheep free from disease. *Clip of wool*—Fair good clip, quite average.

BERWICKSHIRE (Merse). *Wheat*—40 bushels; rather better than last year; quality good where not damaged in harvest time; only grown in favourable situations; seeding,  $3\frac{1}{2}$  to 4 bushels. *Barley*—32 bushels; straw rather below average; average crop; average yield; quality good when not damaged by damp weather in harvest, but mostly good; seeding, 3 bushels. *Oats*—38 bushels; crops suffered from drought in August; straw short; grain excellent quality when not damaged in harvest; seeding, 4 to  $4\frac{1}{2}$  bushels. *Harvest* three to four weeks earlier than last year; began third week of August. *Hay*—35 cwt.; quality of hay good; ryegrass short; clover scarce. *Meadow-hay*—Crop about same bulk as 1907. *Potatoes*—Nearly double last year's crop; 8 to 10 tons; "Up-to-Date," "Langworthy," "Factors," and "Dalhousies"; almost no disease. *Turnips*—20 tons; quality average; on clay ground braiding was late; little or no resowing required. No injury by insects or by weeds. *Live Stock*—Pastures very bare in July and August from severe drought, very fresh and green in September and October; stock thrive well; cattle and sheep free from disease. *Clip of wool*—About average.

BERWICKSHIRE (Lammermoor). *Wheat*—Almost none grown. *Barley*—30 bushels; straw short; quality good where well harvested; some damage by wet damp weather; seeding, 3 bushels. *Oats*—34 bushels; crop short; a considerable quantity of damaged grain, and fodder inferior; seeding, 4 to 5 bushels. *Harvest* three to four weeks earlier than last year; began fourth week of August. *Hay*—30 cwt.; quality good; ryegrass short; clover scarce. *Meadow-hay*—About same bulk as 1907. *Potatoes*—One-third better than last year; 6 to 8 tons; "Up-to-Dates," tubers excellent; well stored; "Up-to-Dates" and "Dalhousies" grown; no disease. *Turnips*—22 tons; quality good; good braids; no resowing. No injury by insects or by weeds. *Live Stock*—Pastures bare in August, strong growth in September and October; stock thrive very well; sheep bad with "scad" foot-rot. *Clip of wool*—About average.

ROXBURGHSHIRE. *Wheat*—Not much grown; crop well got in most cases, and giving well to the acre; straw good quality; seeding,  $3\frac{1}{2}$  bushels. *Barley*—A fine crop; grain of fine quality where well harvested, but a great deal was rather hurried into the stack, which has spoiled the market value a good deal; the yield is over the average, some cases over 45 bushels; straw in most cases fair quality; seeding, about 3 bushels. *Oats*—A heavy crop, giving well to the acre; in most cases the straw is of fair quality; seeding, about 5 or 6 bushels. *Harvest* began about middle or end of August; duration about six weeks; in some of the higher districts it began much later; the late harvested grain was much the best, as the weather improved greatly in September and October. *Hay*—Fair quality, but not a very bulky crop. *Meadow-hay*—Fine quality, and well got. *Potatoes*—All over a very large crop; almost no disease. *Turnips*—A large crop, and fine quality; crop was late in

brairding, and looked badly all summer ; being a fine autumn, the crop is taking up well ; there was a good deal of resowing done. Crops not injured by insects to any extent ; almost no insects ; almost no weeds. *Live Stock*—Pastures little growth, and not good quality ; stock thrive not very well ; almost no disease. *Clip of wool*—Poor quality ; not up to the average, and in most cases deficient in weight.

**SELKIRKSHIRE.** *Wheat*—None grown. *Barley*—Good crop ; 38 bushels, well secured ; seed sown, 3½ bushels. *Oats* do not bulk well ; straw very deficient, but all well secured ; 32 bushels ; seed sown, 5 bushels. *Harvest* began about the usual time, and continued without check till all was secured. *Hay*—Crop 38 cwt., first-class quality. *Meadow-hay*—A good crop, and very well got ; quantity similar to last year. *Potatoes*—Extraordinary crop, running up to 13 tons ; very little disease. *Turnips*—A large crop, exceptionally so ; they brairded well, and never had a check. No injury by insects ; usual weeds. *Live Stock*—Grass was not abundant in the early season, young grass fields being especially bare ; but the autumn changed all that, and seldom have pastures been so good in both quantity and quality as this autumn and early winter ; stock thrive fair in the early season only, but very well indeed in the back end ; cattle and sheep exceptionally free from disease. *Clip of wool*—A full clip, and good quality.

**PEEBLESSHIRE.** *Wheat*—None grown. *Barley*—Straw generally lighter than last year ; from 4 to 4½ quarters barley was the general yield, or just about an average for the county ; 1 quarter more than last year, and all good quality ; seed sown, 4 bushels. *Oats*—Straw finer and lighter than last year ; grain much the same, but of good quality, from 3½ to 4½ quarters ; seed sown, 5 bushels. *Harvest* began usual time ; we had ten days' bad weather, but those who had patience had a fairly good harvest ; late districts, the best harvest for a long time. *Hay*—Crop from 30 to 35 cwt., much the same as last year ; quality good. *Meadow-hay*—Much the same as last year ; on dry ground, crop lighter ; damp, &c., heavier, or exactly the opposite from last year. *Potatoes*—This crop is about double the crop of last year ; quality good, but inclined to be too large in size. *Turnips* generally are a very good crop, but in some cases finger-and-toe did damage ; no shott ones this year ; from 12 to 18 tons per acre, about 2 tons per acre heavier than last year ; brairded well, and only sown once. No pests this year ; no injury by weeds. *Live Stock*—Pastures were fair all summer ; stock thrive fair ; just rather short of meat ; had to be assisted with feeding-stuffs, which did not pay with the general fall in the price of lamb ; of course this is a sheep district. Cattle and sheep free from disease. *Clip of wool*—Under an average ; quality good.

**DUMFRIESHIRE (Annandale).** No wheat grown. *Barley*—Very little barley grown this season ; the crop was so much damaged by discoloration and sprouting, caused by long exposure in the fields, that no reliable estimate can be given as to yield of grain ; seed sown, 3 to 3½ bushels. *Oats*—Owing to wet harvest all the crops in Annandale were more or less damaged, and it is difficult to estimate yield ; it was much damaged by sprouting, and by long exposure the grain became so weakened in its hold on the straw that large quantities were shaken off. After the sheaves were got in quite a growth of young plants sprang up in the stubble, much thicker than an ordinary seeding, showing the serious loss sustained in turning and shaking out the sheaves while exposed in the fields ; yield may be put at 25 to 28 bushels ; straw much discoloured through exposure and heating ; very indifferent fodder ; seed sown,

drilled, 4 bushels; broadcast, 4 to 6 bushels. *Harvest*—In the early districts cutting began about the usual time; on late and high-lying farms harvesting began at least ten days before usual time. *Hay*—The average yield of ryegrass hay is more than last year—29 cwt. per acre where seed well trained; there is, however, a growing practice of eating the young grass with ewes and lambs until well into May; this considerably reduces the yield; the increased weight of crop is principally due to a better growth of clover, the season seemed to favour the crop; the very favourable weather experienced all through hay-time ensured excellent quality. *Meadow-hay* also over last year's average—about 32 cwt. per acre; weather good during haymaking; little or no damaged hay. *Potatoes*—Yield over last two seasons; may be stated at 8 tons; quality not so good, especially amongst the earlier varieties; owing to an exceptionally favourable season the crop matured early; afterwards a spell of mild weather during September and October caused a second growth, which impaired the quality; the wet weather experienced during August and September favoured disease, and, consequently, at lifting there was an unusual proportion of diseased tubers; several varieties were found quite free from disease, and in the same field 50 per cent of the old kinds were found to be unsound; no new varieties planted. *Turnips*, where not affected by "finger-and-toe," may be said to be almost a record crop—average would be about 20 tons; crops weighing over 40 tons per acre were not uncommon; finger-and-toe, however, was very prevalent on lighter soils, and this greatly reduced the average yield; the plants braided well; no resowing was needed. Crops were not damaged by insects. The season being good, weeds naturally were troublesome, but a dry period during June and July favoured the farmer in keeping them under; no great damage done. *Live Stock*—Pastures were of average growth and quality; in May, June, and July they were extra good; the heavy rainfall later did harm; stock did well until late in the season, when after an unusually mild time a second spring set in; this growth caused scour, and it was remarked that stock did not look so well during October; braxy, from the same cause, was prevalent amongst sheep, and "trembling" or louping-ill caused some loss; this was very unusual, as this disease is understood only to make its appearance in the months of April, May, and beginning of June; with the above exceptions, cattle and sheep have been free from disease. *Clip of wool*—Clip rather over an average; quality good.

DUMFRIESSHIRE (Upper Nithsdale). *Wheat*—None grown. *Barley*—None grown. *Oats*—Five bushels more; quality of both grain and straw not good from the continuous rain during harvest, but very much better than last year; 6 bushels generally sown. *Harvest* began about the usual time. *Hay*—Crop about 10 cwt. less than last year, and would be about 1 ton 10 cwt. per acre; quality excellent, and could not be surpassed. *Meadow-hay* about the same, but of superior quality. *Potatoes*—Quite 2 tons more; no disease, except in "British Queens," which on heavy land was pretty extensive; on dry, sharp land not so bad. *Turnips*—10 tons more than last year; quality very much superior; many last year were much soured and damaged by too much wet all season; no second sowing needed. No damage by insects, except cabbage by maggots and caterpillars, which made the crop quite a failure; no injury by weeds. *Live Stock*—Pastures above average; stock thrived exceedingly well; cattle and sheep free from disease. *Clip of wool*—Quality good, and about an average.

DUMFRIESSHIRE (Eskdale). *Wheat*—None grown. *Barley*—None grown. *Oats*—Owing to the very wet weather just when oats were

ready for cutting, it was a long harvest; corn could never be got dry even to cut, and lea corn was mostly laid down quite flat, and a lot of corn dashed off by wind and rain, consequently both grain and straw are not the quantity nor quality, but the yield of grain is better than expected; seed sown, about 4 to 4½ bushels. *Harvest* began a little earlier than last year, but continued for a long time, some corn standing seven or eight weeks in stooks. *Hay*—About 27 cwt., and quality was very good and mostly secured in excellent condition; there was plenty of clover in some places, and other places very little. *Meadow-hay*—Just about the same as last year, but mostly secured in excellent condition. *Potatoes*—The potato crop yielded very well, and was better than last year, there being very few small potatoes among them; there was very little disease, and no new varieties planted. *Turnips*—Very good crops of turnips, and bigger than last year; about 15 to 18 tons. Some of the turnips are just rather big for keeping. They braided very well and came on very well. No second sowings required. There were no complaints about injury from insects. Weeds did not seem to be so bad, and nothing like last year. Charlock, commonly called runches, was the worst weed. *Live Stock*—Pastures more growth and quality better than last year, but pastures seemed to get very quickly bare in the autumn; stock thrive fairly well, but the wet weather was against everything in September; cattle and sheep fairly free from disease, although there is always louping-ill in this district. *Clip of wool*—Much about the same in quality, and just about the average.

**KIRKCUDBRIGHTSHIRE.** *Wheat*—No wheat grown in this district. *Barley*—No barley grown in this district. *Oats*—On lea land a very heavy crop; on average land, 56 bushels; straw long, and lodged in parts. Except in a few very early places which escaped bad weather, both grain and straw were seriously deteriorated by weather, and in many cases by too hasty stacking and consequent heating. First-class samples of oats are very scarce. *Harvest* commenced about usual time, and was very protracted. *Hay*—Hay crop, which in this district is always mixed ryegrass and clover, was not heavy, suffering from drought in June; average yield, 30 cwt. per acre. It was not well saved. *Meadow-hay*—Greatly in excess of last year, and very well saved. *Potatoes*—25 to 30 per cent heavier than last year; average yield, 10 tons. There was no disease in early varieties raised before September, but all growing potatoes suffered severely during that month, and when stored there was a considerable percentage of disease, probably 10 per cent. *Turnips*—Much better than last year; 20 tons; braided well, and no checks throughout; comparatively little insect damage. For a fortnight in early June there was difficulty in keeping green crops clean of annual weeds, chick, and others of that character, but afterwards there was no trouble. *Live Stock*—Pastures under average through summer and until end of September, when there was an extraordinary rush of growth for nearly six weeks.

**WIGTOWNSHIRE.** *Wheat*—Very little wheat grown in the county now; a very poor crop this year, about 25 bushels per acre, and not more than 20 cwt. of straw; seed sown, from 3½ to 4 bushels. *Barley*—A very light crop, about 30 bushels per acre, and possibly 15 cwt. of straw; seed, about 4 bushels. *Oats*—45 bushels, except where badly cut with grub in spring; quality of grain and straw much damaged by the moist, warm weather in harvest; weight of straw, about 25 cwt.; seed, fully 5 bushels sown. *Harvest* began about end of August, or ten days earlier than last year, and lasted about seven weeks. *Hay*—Weight of ryegrass very variable (owing to season and nature of soil), running from 25 to 35 cwt.

The crop was got in very fine condition. *Meadow-hay*—A good crop except on very heavy land, and got in good condition. *Potatoes*—A very good crop of potatoes; better quality than last year; not much disease; 8 to 10 tons. *Turnips*—Have turned out a disappointing crop generally; a considerable amount of disease; weight from 15 to 18 tons; braided well. No injury to crops by insects or by weeds. *Live Stock*—Pastures were good in the early part of the season and in the autumn, but suffered a check for some time about midsummer; cattle did not thrive well for some time during summer; dairy cows did not give their usual average yield; cattle and sheep free from disease. *Clip of wool*—Quality and quantity about average.

**AYRSHIRE.** *Wheat*—40 bushels; fair quality, and better got than last year; 38 cwt. straw; 3 bushels seeds. *Barley*—40 bushels; good quality, and mostly well got; 21 cwt. straw;  $3\frac{1}{2}$  bushels seeds. *Oats*—47 bushels; fair quality, and mostly well got; 30 cwt. straw; seed, 4 to 6 bushels. *Harvest* began about usual time. *Hay*—34 cwt.; of good quality. *Meadow-hay*—35 cwt.; mostly well got. *Potatoes*— $8\frac{1}{2}$  tons; no disease of any consequence; nothing specially new. *Turnips*—22 tons, being a half more than last year; quality good. Grub worm more prevalent on the oat crop than usual. Not more weeds than usual. *Live Stock*—Pastures generally well eaten down; late spring, and pastures never got luxuriant; stock thrive only moderately; cattle and sheep free from disease. *Clip of wool*—About average.

**BUTE.** *Wheat*—None grown. *Barley*— $3\frac{1}{2}$  bushels sown; above average for straw; yield, 38 bushels; quality good; cutting commenced latter week of August; well got. *Oats*—5 bushels sown; cutting commenced first week of September and finished 10th October; crop above average; yield, about 42 bushels; a very protracted harvest, fairly well got, except in very sheltered places. *Hay*—Fair average crop, well got; would average about 2 tons. *Meadow-hay*—Very little grown, and this was badly got. *Potatoes*—Digging began 25th June of early potatoes; an extra large crop, an average of 10 tons, some fields as high as 14 tons per acre; some potatoes were so large that they were put aside for feeding purposes; kind mostly planted were "Epicures"; late kinds, about 7 tons per acre; no disease. *Turnips*—From 20 to 25 tons; braided well; no disease, except in some lots on same field where different seed sown; some very bad with finger-and-toe; seed caused this, as other plots quite free. No injury by insects or by weeds. *Live Stock*—Pastures fair average; better than last year; stock did well; cattle and sheep free from disease. *Clip of wool*—Average.

**ARRAN.** *Wheat*—None grown. *Barley*—None grown. *Oats*—A fair crop where not spoiled with grub, whole fields being either resown or allowed to stool with the little braird left; about 30 bushels; weight under average; seed sown, 5 to 6 bushels. *Harvest* began about the 8th September. *Hay*—Quite an average crop; got well secured; seed good quality, and made a good price; about 25 cwt. on good land. *Meadow-hay*—Very little grown; got well secured; fair crop. *Potatoes*—Crop very good; tubers rather small, say 6 to 8 tons on fair land; a good deal of disease where land inclined to be damp. *Turnips*—Very variable, say 14 tons; a good deal of finger-and-toe; braided well; no resowing. Not more than usual damage by insects; fewer weeds than usual. *Live Stock*—Pastures good average growth; stock thrive not quite so well as last year; a good deal of foot-rot among sheep during autumn. *Clip of wool*—About an average.

LANARKSHIRE (Upper Ward). *Wheat*—None grown. *Barley*—None grown. *Oats*—30 to 35 bushels, possibly averaging a little less than last year, but of better quality; bulk of straw considerably less owing to earlier harvest, but quality better than last year. Seed sown, 5 to 6 bushels. *Harvest* began in the end of August, about ten days earlier than usual, but was rather prolonged, as the weather broke before the crop was all secured. *Hay*—An average crop,  $1\frac{1}{2}$  to 2 tons per acre, but little aftermath; quality good. *Meadow-hay*—A fair crop, but possibly averaging a little less than last year. *Potatoes*—A full crop, averaging 8 or 9 tons, about 2 tons better on the average than last year; considerably more disease than usual, commencing in August, and principally affecting the early varieties; no new varieties planted to any extent, "Suttons," "British Queens," "Dates," and "Factors" being the most common varieties. *Turnips*—18 to 20 tons on the average, being a little less than last year, but there were some heavier crops where grown under very favourable conditions; crop braided well, and no resowing required. Not more than usual injury by insects; not more than usual weeds, and season favourable for dealing with them. *Live Stock*—Pastures deficient a little at beginning of season, but of fully average growth at end of season; stock thrived well; cattle and sheep in general have been free from disease, but a greater death than usual from sickness in the month of November is generally reported. *Clip of Wool*—Quantity and quality average, but price very low.

LANARKSHIRE (Middle Ward). *Wheat*—The wheat crop of 1908 was above the average both in quality and quantity, but unfortunately much of the grain was depreciated in quality owing to the wet weather in September. From 30 to 50 bushels; straw, 30 to 38 cwt.; seed sown,  $3\frac{1}{2}$  to 4 bushels. *Barley*—Almost none grown. *Oats* were a heavy crop, with very fine quality of grain where harvested before September, and where no heating in the stack took place. Much of the grain was spoiled in the fields, and also with heating in the stack; 30 to 50 bushels; straw, 35 cwt.; seed sown,  $4\frac{1}{2}$  to 5 bushels. *Harvest* commenced about the middle of August, and the weather conditions were favourable till the beginning of September, but there came four weeks of continuous wet weather which did much damage to the crops which were not harvested, and which were nearly ready for harvesting when the rain commenced to fall. *Hay*—Ryegrass and clover-hay were good crops; from  $1\frac{1}{4}$  to  $2\frac{1}{4}$  tons; all the hay was got in perfect condition, and the prices received for hay out of the small ricks for immediate delivery were from £2, 10s. to £3 per ton. *Meadow-hay* and timothy hay gave a yield of from  $1\frac{1}{4}$  to 3 tons. *Potatoes*—The season of 1908 was one of the most favourable in recent years for potatoes; a few heavy-cropping varieties have been largely planted, bringing up the yield above the average of any past season; the quantity per acre will have been from 7 to 11 tons; there has been very little disease, but a good deal of heating and growing has taken place in the pits; the price is almost the lowest on record; good potatoes can be got for 35s. to 40s. per ton. *Turnips* have been a most abundant crop, the mild weather during September, October, and November causing a rapid growth; the yield will be from 18 to 28 tons. There was less damage by insects than in almost any former year, with the exception of cabbages in the earlier part of the season. *Live Stock*—The season has been a remarkably good one for pasture, and a record one for the growth of aftermath and late pasture; stock thrived well, and were able to get a full bite late in the season; cattle and sheep have been fairly free of disease.

LANARKSHIRE (Lower Ward) *Wheat*—A good crop, but a lot of it spoiled owing to the close wet weather; 40 to 48 bushels, and about 2 tons of straw per acre; 4 bushels seed sown. *Barley*—None grown. *Oats*—A splendid crop, but, like the wheat, a great deal damaged; it is yielding well, and it would have been a record grain harvest if September had been a good month; 30 to 40 bushels, and 5 bushels seed sown. *Harvest* this year three weeks earlier than last year, but just about an average for beginning. *Hay*—Ryegrass hay this year was disappointing, but very well got; 1½ to 2 tons. *Meadow-hay*—A good crop, and quite as good as last year; 3 to 4 tons per acre. *Potatoes*—A big crop, far better than last year; 8 to 10 tons; little disease, and few new kinds planted. *Turnips*—Also a good crop, and braided well; 25 to 30 tons. No injury by insects or by weeds. *Live Stock*—Owing to the dry summer pastures were a little bare, but later on and at the back end of the year it was extremely good; cattle and sheep free from disease.

RENFREWSHIRE. *Wheat*—A very good crop grown, but owing to the bad harvest the worst stacked for years. *Barley*—Very little barley grown. *Oats*—Very heavy crop; in the early districts much wasted by the bad weather; in the higher or later districts good harvest, giving quite up to average results. *Harvest* began much about the usual time. *Hay*—Quantity and quality quite up to last year; 2 tons 10 cwt. *Meadow-hay*—None in district. *Potatoes*—Average yield about 8 tons 10 cwt.; much the same as last year; very little disease; no new varieties. *Turnips*—About 20 tons; quality as good as last year; braided well; no rot as a rule. No injury by insects. Crops not injured by weeds where good husbandry carried out. *Live Stock*—Pastures were during the season of average growth and quality with last year; stock thrived on very well indeed; cattle and sheep free from disease. *Clip of wool*—Fully average.

ARGYLLSHIRE (Lochgilphead). *Wheat*—None grown. *Barley*—None grown. *Oats*—Not as good as last year, a lot of grain being lost with so much handling; about 5 quarters per acre; seed sown, from 5 to 6 bushels. *Harvest* began ten to twelve days earlier than last year. *Hay*—Ryegrass hay a light crop; about 1½ ton; quality good. *Meadow-hay*—About last year's crop, say 3½ tons, and mostly well got. *Potatoes*—Potato crop heavier than last year, perhaps 7½ tons; a good deal of disease in some varieties, owing to mild, damp weather; no new varieties planted. *Turnip* crop heavier than last year, unless where ground was wet; crop about 25 tons; quality very good; braided well, and no second sowing. Not any damage with insects. Some corn after turnips pretty badly choked with yare, owing to land being wet ploughed. *Live Stock*—Pastures were about average growth, and quality very good; stock did very well indeed; cattle and sheep free from disease. *Clip of wool*—Quality of wool good average; weight rather above last year.

ARGYLLSHIRE (Kintyre). *Wheat*—None grown. *Barley*—About 6 bushels better; quality fairly good where not damaged by weather; straw, about same yield as last year; seed, about 4 bushels. *Oats*—Lea oats wormed badly in most places, but where no worming took place as good as last year; yield, about 6 quarters; straw, fully as bulky as last year; seed, about 5 bushels. *Harvest* began about usual time, but very protracted through bad weather; finished up bad. *Hay*—About same as last year; yield, 2 to 4 tons per acre. *Meadow-hay*—Hardly so bulky as last year, but better got. *Potatoes*—Earlies not so good by about 2 tons; lates as good as last year; not much disease. *Turnips*—Better by about 5 tons; braided all right; no second sowing. Lea corn by grub

much greater than usual. Weeds nothing unusual; easier cleaned than last year. *Live Stock*—Pastures were during the season of average growth and quality with last year; stock thrived all right; cattle and sheep free from disease. *Clip of wool*—Average.

ARGYLLSHIRE (Islay, Jura, and Colonsay). *Wheat*—None grown. *Barley*—None grown. *Oats*—A good average crop; the quantity of grain similar to last year, but the quality on both years was below the average; quantity of straw above average, but quality below the average; 5 to 6 bushels sown broadcast, and about 4 with sowing-machine. *Harvest* started rather earlier than usual, and about three weeks earlier than last year; owing to damp, muggy weather in September much damage was done to crops. *Hay* crop would average 5 cwt. per acre more than usual, but the quality was not equal to the crop of 1907. *Meadow-hay*—Good average crop. *Potato* crop was equal to that of last year, both as regards quantity and quality; not more disease than usual. *Turnip* crop rather better than last year; crop braided well, and not more than one sowing was required. Much damage was done by grub (leather-jackets); other injuries much the same as usual; not more than usual damage by weeds. *Live Stock*—Pastures were during the season of average growth and quality with last year; stock thrived very well; trembling and braxy have caused heavy death-rate in sheep; cattle have been fairly free from disease. *Clip of wool* was quite equal to the average both in quality and quantity.

DUMBARTONSHIRE. *Wheat*—About 30 bushels; where secured early in good order quality better than last year; in some districts where harvest was not so early much damage was done by weeks of damp, close weather; 3 bushels of seed sown. *Barley*—Very little in the county. *Oats*—30 to 35 bushels; good where secured early, but in most places damaged more than last year by rain and damp, close weather; about 5 bushels of seed sown. *Harvest* began in some parts of the county about two weeks earlier than usual, but in most districts just about the usual date. *Hay*—Quantity about 1½ to 2 tons per acre; quality good. *Meadow-hay*—A very good crop, and well got; better than last year. *Potatoes*—A better crop than last year; quantity on good land from 11 to 7 tons, and on the higher districts from 8 to 5 tons per acre; some disease in September; no new varieties reported. *Turnips*—A large crop; 20 to 30 tons; crop braided well; no resowing. A good deal of damage done in some districts to lea oats by grub. Not much injury by weeds, but "redshank" was bad on some fields sown June and July with rape. *Live Stock*—Pastures in most districts above the average; some farmers report not quite up to average; stock did fairly well, and were free from disease. *Clip of wool*—Fair quality; about average.

STIRLINGSHIRE (Western). *Wheat*—None. *Barley*—None. *Oats*—35 bushels; the quality of grain and straw was very good, and better than last year before cutting, but was considerably damaged by the wet weather which prevailed during harvest. *Harvest* began about 31st August, being a few days earlier than last year. *Hay*—About 1 ton 12 cwt.; quality fairly good, but in some cases not too well secured on account of unfavourable weather; there was a scarcity of clover. *Meadow-hay*—About an average; not very well got. *Potatoes*—About 8½ tons, or a half more than last year; in some instances disease set in when lifting, and in others not till the crop was in pits; one lot of "Epicures," about 4 acres, which had been boxed, yielded 13½ tons in August, and there was no disease. *Turnips*—25 to 35 tons; quality and braird very good; only one sowing. Some injury from redshank, and rather

more than last year. *Live Stock*—Pastures of average growth, but quality not so good as last year; cattle did not grow to same extent as last year; cattle and sheep free from disease. *Clip of wool*—About last year's clip.

**STIRLINGSHIRE (Eastern).** *Wheat*—4 bushels seed sown; fairly good crop, and has thrashed better than last two years; yield, 48 bushels. *Barley*—4 bushels sown; good grain and fair straw; yield, 41 bushels; grain high coloured. *Oats*—3 bushels seed; 42 bushels yield, and good straw, but very badly harvested. *Harvest* began about 1st September, but was very prolonged and crops much wasted. *Hay*—Fair good crop; well harvested; 2 tons 5 cwt. *Meadow-hay*—Smaller crop than last, but well got. *Potatoes*—8 tons; early varieties diseased, but later kinds free, but are making small prices. *Turnips*—24 tons; fair crop; brairded well; no second sowing; suffered from want of rain in August. *Live Stock*—Pastures during the season rather poor; stock did not thrive well all summer, but good back end; cattle and sheep free from disease. *Clip of wool*—Under an average on account of cold spring.

**CLACKMANNANSHIRE.** *Wheat*—Fair crop; of average yield; from 35 to 38 bushels; crop suffered from the bad harvest, and unless early cut was difficult to secure in good order;  $3\frac{1}{2}$  to 4 bushels sown. *Barley*—The worst crop of the season, and damaged with rain before it could be got in; yield, from 26 to 30 bushels; seed sown, 4 bushels. *Oats*—The oat crop was a good one, being a full average and better than last year; although damaged with the wet harvest it was not so much destroyed as last year; yield, 32 to 38 bushels; 4 to 5 bushels sown. *Harvest* commenced from a fortnight to three weeks earlier than last year, and although good weather prevailed at the beginning it got very wet afterwards and continued so until near the finish, which damaged the crops a good deal. *Hay*—A good average crop, and mostly secured in excellent conditions except in late places; there was less clover in the hay this year than usual; average yield, fully 2 tons. *Meadow-hay*—A good crop, well got, and much better in bulk and quality than last year. *Potatoes* were a fair ordinary crop, slightly better than last year, and of good quality; not much disease to speak of except in very early varieties; not many new varieties planted; yield from 4 to 6 tons. *Turnips* were an excellent crop, considerably better than last year; they made the best growth late in the season, otherwise they would not be so good; average yield, 15 to 20 tons; the crop brairded well; no second sowing required. No damage to any extent was done by insects. Little or no damage done by weeds; the summer being comparatively dry, the weeds were easier kept down. *Live Stock*—Pastures and grass were much better this season than last year, and stock did very well on them; there was an abundance of grass late in the autumn, much above the average; stock of all kinds thrived well on grass, and they left a better margin of profit than last year; cattle and sheep were free from disease. *Clip of wool*—A fair average, and of good quality.

**FIFESHIRE (Middle and Eastern).** *Wheat*—After a cold and backward spring, the bright sunshine and warm weather in July month greatly benefited the crops, and a bountiful and excellent harvest was anticipated, and in the earlier districts of this county the bulk of the grain was secured in fine order; the later districts, however, suffered from the dull, moist weather of September, when much grain was sprouted in the stook. Owing to the late and disastrous harvest of last year, a very small acreage of wheat seed could be sown in the autumn, and an unusually large acreage of spring wheat was seeded in the month of February under very favourable weather conditions. This crop should yield from 36 to 40

bushels of grain of fine quality, and good length of straw; about  $1\frac{1}{2}$  ton of seed sown—broadcast, 4 bushels; and with drill-machine, 3 bushels. *Barley*—This crop was superior to last year, and maturing in bright sunshine; the grain was plump and of fine mellow colour; the average yield will be from 44 to 48 bushels, and weight of straw 1 ton; seed sown—broadcast, 3 bushels; and with drill-machine, 2 to  $2\frac{1}{2}$  bushels. *Oats*—Generally a fine crop, and beautifully ripened, and where secured early the colour of the grain is the finest for many seasons, while the straw is nearly equal to good hay for fodder purposes; average return, 48 to 56 bushels, and of straw, 1 ton; seed sown—broadcast, 5 bushels; and with drill-machine,  $3\frac{1}{2}$  bushels. *Harvest* commenced at least two weeks earlier than last year, and about the usual time, and at first was favoured with unusually fine weather, which, however, broke down in September. *Hay*—A fair crop, and secured in excellent condition. Average yield,  $1\frac{1}{2}$  ton per imperial acre, and better quality than last season's crop. *Meadow-hay*—Very little made in this district, and this crop will be more productive than last year. *Potatoes*—This crop has lifted well, and the field should be from 8 to 10 tons; but disease and soft tubers are noticeable more or less in the pits, and may spread during the winter. Amongst the newer varieties, "M'Keracher's Mayfield Blossom" is very popular, and a large acreage of these were planted in this district. *Turnips*—Very good crop, and with an open autumn benefited very much, and the bulbs are of excellent feeding quality; average crops will yield—swedes, 20 to 25 tons per imperial acre; and yellows, 20 tons; the braird came away regularly, and no resowing had to be done. No injury done to the crops by insects. Charlock was more prevalent than usual, especially amongst the turnip braird; other annual weeds appeared as in an ordinary season, but no more damage done than usual. *Live Stock*—Hay foggage, clover, and ryegrass were very backward to begin with, but improved considerably during September; quality not so good as last year; stock thrived well, especially during the latter part of the season; cattle and sheep generally free from disease, but cases of anthrax continue to be reported to the local authorities; sheep stocks healthy. *Clip of wool*—Of good quality, and about an average.

FIFESHIRE (Western District). *Wheat*—On the good wheat-producing soils there will be 38 bushels and 30 of straw, and the quality is fine except where the grain was exposed to the wet week; four bushels are usually sown. *Barley*—On the free barley soils there will be 40 to 42 bushels of grain and about 1 ton of straw; on poorer soils less, according to quality and situation; the quality of the grain is particularly fine except when it gets damage from wet and mist;  $3\frac{1}{2}$  bushels sown. *Oats*—On free soils oats are a good crop, and will average about 40 to 44 bushels, with straw in proportion; but when the land was stiff they suffered from want of rain during June and July, and in some cases are a very disappointing crop, and very deficient in straw; 4 to even as high as 6 bushels sown; all depends on climate and conditions of soil and variety of seed. *Harvest* began about 26th August, which was three weeks earlier than the disastrous one of 1907; but from 21st to 26th September, a week of wet, close weather set in, which sprouted all outstanding grain, thus spoiling what would otherwise have proved a remunerative crop, and reducing the price by about 5s. per quarter; this is much to be regretted after the experience of crop 1907. *Hay* was a middling crop on some farms, clover especially never recovering from the excessive rain and sourness of the land of the summer of 1907, so that the quantities per acre were difficult to estimate. *Meadow-hay* was a fairly good crop. *Potatoes* are a various crop as to yield; on free, good potato soils in fine condition we hear of crops of 8 to 10 tons per acre; but on stiff and poor

soils the crop will be found a small one; when weighed and dressed for market there will be many 4 to 5 ton crops. There is a little disease, but not much. *Turnips*—The same remarks apply to the turnip crop as to the potato one, there being a larger proportion of small, badly grown roots than usual to make the crop a heavy one per acre when weighed. In some cases the seed did not braird quickly, the weather being too dry. The long open weather has, however, helped to swell the crop somewhat. Crops not to any serious extent injured by insects. Yellow weeds or skellock were rather abundant in some oat crops, but nothing out of the ordinary. *Live Stock*—Pasture grass was not only abundant, but all kinds of stock thrive well, partly on account of the warm nights, and grass was never better in the late autumn; cattle and sheep perfectly free from disease. *Clip of Wool*—The wool clip in many cases was lighter than last year, and the price down by about one-half.

PERTSHIRE (Western District). *Wheat*—Fair crop of straw; average yield of grain, 38 bushels; crop was mostly secured before the weather broke; the area of wheat grown would be quite an average; seed, 3 to 3½ bushels. *Barley*—Not quite an average bulk of straw, but the yield of grain would be fully an average; yield, 32 bushels. This crop was not secured in time to escape the bad weather, and the grain and straw were consequently very much damaged; seed, 3½ bushels. *Oats*—A full average crop of straw and grain, and but for the fact that in many instances quite one-third of the latter was left on the ground, the yield would have been 42 bushels on the strong land, and 34 to 36 bushels on dry-field land; seed, 4 to 4½ bushels. Very little of the oat crop was secured before the weather assumed such a broken character, and in general the crop was hopelessly damaged and very badly sprouted. *Harvest* was started quite three weeks earlier than in 1907, but its close was even later than in that year, the bulk of the crop having been secured during the few good-weather days about the middle of November. *Hay* was fully an average in bulk, but much of it was secured in bad condition. Timothy hay is much grown on the strong land in the district. Weight of hay on carse land, 38 cwt.; on dry-field land, 25 cwt.; timothy on carse land, 42 cwt. *Meadow-hay*—Quite an average crop, and fairly well got. *Potatoes*—More than an average crop of good quality; 6 to 7 tons; not much disease; very few new varieties are planted. *Turnips*—Very few grown on carse land; on dry-field land the weight would be 18 to 20 tons, which is a full average crop; seed brairded well, and no second sowing; crop was of good quality, but reports are prevalent that the roots have not kept well during the winter, and this is probably accounted for by the fact that on account of the abnormal and unseasonable growth during the months of November and December, the roots were stored when they were too full of sap and not ripened. Not much injury by insects, and crops generally were free from weeds. *Live Stock*—Pasture was plentiful everywhere, and cattle did fairly well on them, but left little profit for the summer grazing, as stores were much too dear in spring; cattle and sheep free from disease. *Clip of wool*—Fully an average, both as regards quantity and quality.

PERTSHIRE (Eastern District). *Wheat*—A good average, and good quality where harvested before the weather broke. Much of the spring-sown wheat, being late, was greatly damaged by sprouting; yield, about 36 bushels; seed, 3 to 4 bushels. *Barley*—A good average crop of varied quality; some samples excellent; others very much damaged by the weather; yield, about 40 bushels; seed, 3 to 4 bushels. *Oats*—Quite an average crop, but samples also very irregular in quality; yield, about 50 bushels; seed, 4 to 6 bushels. *Harvest* began about the usual

time, and all went well to start with ; a third of the crop was secured in good order, but the remainder was very much damaged, both in grain and straw, during the protracted time of wet, close, muggy weather. The harvest of 1908 must be recorded as one of the worst, although not so ruinous as that of 1907. *Hay*—A good average crop, and generally well secured ; yield, about 2 tons per acre. *Meadow-hay*—None grown. *Potatoes*—Very heavy crop, averaging 8 to 10 tons per acre. There was some disease amongst the "Up-to-Date" varieties at lifting time, and a considerable amount has appeared since, the result being that they are not keeping well in the pits. No new variety of outstanding merit introduced. *Turnips*—A very bulky crop, but there was a considerable amount of canker and finger-and-toe amongst them, and they are not likely to keep too well in the stores ; weight would average 25 tons ; no second sowing. Not more than usual injury by insects. Not more than usual injury by weeds. *Live Stock*—Pastures a good average ; there was a strong growth in the autumn ; stock thrived very well ; cattle and sheep free from disease, except for an occasional case of anthrax. *Clip of wool*—A good average.

PERTSHIRE (Central District). *Wheat*—Very little grown ; about 30 bushels ; straw of good quality ; about 5 bushels sown. *Barley*—A fair good crop in the earlier districts ; about 35 bushels ; grain and straw of good quality, and well got in most places where grown ; about 5 to 6 bushels sown. *Oats* were a good crop, and well got in most of the districts, but a great deal very badly got in others ; about 40 to 50 bushels or more of the new varieties. Straw was a good crop and of good quality in the earlier parts ; 5 to 8 bushels sown. *Harvest* in the lower districts would begin at the usual time, and in some instances was quickly finished, with grain in splendid condition. In some of the later districts it was almost as late and as bad as in the previous year, while on the average there would be a good deal of spoil grain. *Hay*—There would be a fair average crop of ryegrass and clover-hay got in splendid condition, averaging from 1 to 1½ ton. *Meadow-hay*—The meadow-hay was also a fair average crop, and most of it was got in in splendid condition ; but in the later districts some of it was almost entirely lost ; it would average from 1 to 2 tons. *Potatoes*—The potato crop would be above the average ; from 5 to 8 tons dressed ; there was little or no disease in this district ; Langworthy is still practically the potato of the district. *Turnips*—There was a good crop of turnips, both yellows and swedes, which improved very much in the autumn, especially the swedes ; the crop would vary from 15 to 20 tons ; the crop braided fairly well, and there was almost no second sowing. Little damage by insects ; about the same as usual. Not very much injury by weeds ; there was a good deal of red-ribbed weed in the potatoes after hoeing ; otherwise, no more than usual. *Live Stock*—Pastures were during the season of average growth and quality with last year ; there was a fair grazing season ; it was bare a little on light lands, which were easily burned ; stock thrived well, but the excessive wet in the autumn caused some loss of condition ; no disease in the district ; even wintering hogs have lived well. *Clip of wool*—The clip of wool was quite an average.

PERTSHIRE (Highland District). *Wheat*—None sown in the Highland district. *Barley*—Less barley sown this year than ever ; short straw, but fair returns ; about 32 bushels, and all of good quality and well secured. *Oats*—A good average crop, both in lea and sown-out land ; quality good ; fair weight, and about 48 bushels ; mostly all well secured. *Harvest*—Owing to the favourable summer the harvest was six weeks earlier than last year ; was general on 24th August, and completed on many farms

on 10th September; for a month after that unsecured crops suffered greatly through sprouting in the stook. *Hay*—An average crop; about 30 cwt. per acre; early cut, and well secured, but a great want of clover all over the district, and no aftermath. *Meadow-hay*—A very heavy crop; early ready for cutting, and all secured in good condition. *Potatoes*—Much heavier crop than last year, both in quantity and in size, and of good quality; about 8 tons; earlier kinds a good deal diseased, but all well secured; no new varieties planted. *Turnips*—A very heavy crop; large in size, but quality not so good, being spongy, and not so fleshy and solid as last year, with a considerable percentage diseased and soft; over 20 tons; braided well, and came early to the hoe; no second sowing required, and no complaints of fly or frost. No insects whatever. Crops much easier kept clean, and far less damage than usual. *Live Stock*—Pastures throughout the year very good; above the average in growth, especially during the autumn months and late on in the season; the growth was unprecedented in September and October; stock thrived well all summer, but did not seem to put on condition nor yield the quantity of milk expected, looking at the quantity of grass on the fields; cattle and sheep quite free of all kinds of disease, but a bad season for maggots on sheep, especially on rough pasture and bracken lands. *Clip of wool*—Fully over an average in bulk, and of very good quality.

FORFARSHIRE (Western District). *Wheat*—36 bushels grain and straw, mostly good; seed sown, from 3 to 4 bushels. *Barley*—42 bushels grain and straw; variable; 4 bushels sown. *Oats*—50 bushels grain and straw; would vary on early and late places, the early places being good. *Harvest* began with me on 17th August, and I finished leading on 18th September, commencing just exactly one month before last year, and finishing two months and five days earlier than last year, but some were late in finishing, as the weather broke down just after I finished. *Hay*—The hay crop would be under last year for quantity, but the quality was good; from 1½ to 2 tons. *Potatoes*—There would be from 3 to 4 tons more on some land, but I should say an average of 2½ tons more than last year. *Turnips*—There would be about an average of 28 tons, and quality would be much better than last year; a good braird. No injury to speak of from insects. No injury by weeds. *Live Stock*—About the middle of summer pastures were very bare indeed, but improved very much later in the season, as the weather was unusually warm; stock thrived fairly well; cattle and sheep free from disease. *Clip of wool*—The wool clip would be slightly under an average.

FORFARSHIRE (Eastern District). *Wheat*—42 bushels; quality excellent where stacked before weather broke, afterwards very bad, grain being practically wholly sprouted; 4 bushels seed sown. *Barley*—44 bushels; finest for years where stacked before weather broke, afterwards bad; 3 to 4 bushels seed. *Oats*—56 bushels; excellent when stacked before weather broke, afterwards bad, straw specially so; 4 to 5 bushels seed. *Harvest* fourteen days earlier than usual. *Hay*—2 tons. *Potatoes*—10 tons; very slight disease; mostly old varieties planted. *Turnips*—27 tons; braided excellently. *Live Stock*—Pastures much destroyed by drought in early summer; stock thrived well, but only about one-half usual number kept, on account of scarcity of grass through drought; cattle and sheep free from disease. *Clip of wool*—Good; about an average.

ABERDEENSHIRE (Buchan District). *Wheat*—There is no wheat grown. *Barley*—About the usual quantity sown this past year; yield fully as good as last, but the colour somewhat discoloured owing to the wet

weather in the earliest part of harvest; weight from 52 to 56 lb.; straw of fair quality; seed sown, about 4 bushels. *Oats*—The oat crop has turned out good, although it would have turned out even better had not a good deal been laid and twisted about the beginning of harvest, and the early cut suffered a little owing to having had to stand in the stock; both oats and straw are much superior to last year, especially the straw, which is very good, and readily eaten by stock; seed sown, from 5½ to 8 bushels. *Harvest* began about 20th September, and the crop was generally in the stackyard three weeks later. *Hay*—i.e., ryegrass and clover—secured in first-class order, but not such a heavy crop as last year; reaped 20 to 30 tons per acre. *Meadow-hay*—Scarcely any grown in the district. *Potatoes*—Very heavy crop, but in some cases disease was more prevalent than in some years. *Turnips*—Not anything like the crop of last year, and in many cases finger-and-toe, or rather a fungus, is very prevalent, so that the crop where such occurs is very deficient—from 10 to 20 tons per acre. The braird came away very well, and there was scarcely any resowing. There was practically little or no damage done by insects. Good deal of weeds in the later end of season owing to the wet weather. *Live Stock*—Pasture was not luxuriant during the early part of the season owing to the dry weather, but during the later part of the season the grasses were of a greener hue, and sweeter for the grazing stock. Stock did fairly well during the season. There was little or no disease in this district. *Clip of wool*—The quality of clip wool was of an average.

ABERDEENSHIRE (Formartine District). *Wheat*—None grown. *Barley*—Last year, 30 bushels; this year, 36 bushels, with scarcely an average bulk of straw. The bushel weight is high—viz., about 56 lb., and the grain is of excellent quality; seed sown, 4 bushels. *Oats*—Last year, 40 bushels; this year, 44 bushels, with an average bulk of straw. The bushel weight is about 43 lb., and the quality of grain and straw very fine. Seed sown, 5 to 7 bushels. *Harvest* began about the usual time, and the weather was good, except about ten days of rather wet foggy weather in the middle of it, which, however, did not seriously injure the crop. Seeds—i.e., ryegrass and clovers—are cut for hay, and yielded about 25 cwt., or 3 cwt. less than last year; quality very good. *Meadow-hay*—None grown. *Potatoes*—Last year, 4 tons; this year, 8 tons; an extraordinary crop of very fine quality; not much disease. *Turnips*—Last year, 18 tons; this year, 14 tons; a poor crop, and much affected with finger-and-toe and rotteness. This has probably been caused by wet ploughing of the land out of stubbles. There was little damage from insects, but considerable damage from rooks and wood-pigeons, which have become a pest. Little damage from weeds. *Live Stock*—Pastures were of good growth and of excellent quality. Live stock thrived better than usual upon them. Cattle and sheep free from disease.

ABERDEENSHIRE (Strathbogie District). *Barley*—The past season was favourable for barley, while there was, perhaps, rather little moisture to ensure a bulky crop of straw. The heat and dry weather experienced during summer and autumn in Strathbogie were favourable to the grain, which is of excellent quality, weighing generally about 56 lb. per bushel. An average crop may be stated at 36 bushels. *Oats*—Oats after lea were generally fairly bulky, but after roots somewhat disappointing. Stackyards did not, therefore, bulk so well as farmers could have wished. The straw and grain are of excellent quality, grain weighing from 40 to 42 lb., and yielding about 38 bushels. *Harvest* was about ten days earlier than the average, and owing to the fine weather during the time it was

of short duration. *Hay*—The weather being dry and warm during the growing season for hay, affected the bulk adversely, which was much below an average. Perhaps 20 cwt. per acre may be given as an average yield. There was a great scarcity of aftermath, and flockmasters experienced great difficulty in getting a sufficient quantity to harvest their half-bred and the better class of cross-bred lambs. *Potatoes*—The potato crop generally bulked over an average. The quality of the tubers is excellent, and they were gathered in unusually good condition. There was no disease. There were none of the new varieties planted. Those farmers who have tried some of the newer sorts have been disappointed with the result, and have given them up. *Turnips*—The turnip braird came away nicely to the hoe, and during the season they had a good appearance; but when carting commenced, complaints were heard that the weight per acre was not up to anticipations formed by our shrewdest farmers. All crops were free from insect pests during the season. There was no unusual damage caused by weeds. *Live Stock*—Pasture for stock was not so abundant as in 1907, but stock generally did well on the grass. With the exception of anthrax, which appears to be becoming more prevalent in this district, cattle and sheep were generally free of disease. *Clip of wool*—The quality of the clip of wool was good, and an average in weight.

**BANFFSHIRE (Lower District).** *Barley*—A good fair crop of 36 bushels, weighing from 55 to 56 lb. per bushel; seed, 4 bushels; straw of good quality. *Oats*—An average crop of 44 bushels, weighing from 40 to 44 lb. per bushel; straw under an average; seed, 4 to 6 bushels; crops got in excellent order. *Harvest* began about 1st September; about the average. *Hay*—Crop was light, owing to dry weather in May and June, from 100 to 150 stones; clover was deficient; ryegrass fair. *Potatoes*—A good crop of from 6 to 8 tons, of excellent quality; no disease. *Turnips*—Swedes a good crop of about 30 tons, and yellows a fair crop of from 20 to 25 tons; bulbs came fairly well; a few cases of resowing. No injury from weeds. *Live Stock*—An average season for grass. Stock thrived well; a good few cases of anthrax in the quarter, and no one seems to know the cause nor the cure. *Clip of wool*—An average clip; price very low, from 5d. to 6d.

**BANFFSHIRE (Upper District).** *Barley*—Less area sown than last year; good average crop; returns of 5 quarters and over; weight 56 lb., and in cases 58 lb.; seed used, generally 4 bushels. *Oats*—In general a full crop, except some instances; after lea, somewhat thin; good returns of grain in fine soils, up to 8 quarters, while the hillside regions were averaging 5 quarters—a most unusual quantity, and all of prime quality. *Harvest* was general from middle of September, about ten days earlier than the average seasons; two causes favouring this advance—viz., the complete change of seed and the fine weather of the months of June and July. *Hay* crop a small yield, due to lack of clovers and lack of rains in month of June; very few instances of 100 stones per acre being got. *Potatoes* only grown for home use; the crop has not bulked in general, but fine quality and secured in fine condition. *Turnip* crop came away well for a start, but had slight checks from dry weather, and on sharp soils are not bulking too well; on soft deep soils larger bulk, but much affected with finger-and-toe and rot. An exceptionally fine season for cleaning land; no hindrance from weeds of any kind experienced. *Live Stock*—Pastures came out well, but soon dried up and failed, owing to great heat and dryness of June and July, and aftermath was a failure. Stock did well where pastures were not too full stocked and too much bared down at first; happily no disease to note.

**MORAYSHIRE.** *Wheat*—A good crop; about 41 bushels per acre; 1 bushel more than last year; quality of both grain and straw good. *Barley*—A fair crop in some districts; but in other parts, where it suffered from drought, it was a very light crop; average for the county about 33 bushels, being  $2\frac{1}{2}$  bushels under last year's crop; quality of both grain and straw good, very much superior to last year, chiefly on account of the good weather in harvest; seed sown, from  $3\frac{1}{2}$  to  $4\frac{1}{2}$  bushels. *Oats* suffered very much from drought on light land, but on deep loam they were a good profitable crop and of good quality, both grain and straw being well harvested; average yield for the county about 42 bushels, being 4 bushels less than last year; seed sown, from 5 to 7 bushels. *Harvest* was general about the 26th August, and finished about the 30th September; last year harvest began about the 15th September, and finished about the 25th November. *Hay*—A rather light crop, and lacking much in clover, but secured in good condition; average about  $26\frac{1}{2}$  cwt. per acre, being 6 cwt. under last year's crop. *Meadow-hay*—Rather under last year's crop, but there is very little grown in the county. *Potato* crop is very much superior to last year both in quantity and quality; average for the county about  $6\frac{1}{2}$  tons, being 2 tons more than last year; in some farms they would average from 10 to 12 tons, and the tubers of extra large size, some weighing up to 2 lb. I hear of no disease; a few new varieties planted. *Turnips*—A fair crop; average for the county about 20 tons, being 4 tons more than last year. On some farms of good land, well cultivated and carefully singled, they weighed over 41 tons for swedes, and over 47 tons for yellows, as per weights at the sulphate of ammonia competitions; they braided well, and required no second sowing; no damage by insects, but the crop suffered from the extra dry weather in September. No damage from weeds on good cultivated farms. *Live Stock*—Pastures under growth of last year, but stock thrived and did better, owing to the dry warm summer; no disease in the county, except an occasional case of anthrax. *Clip of wool*—Much about the same average as last year, both as to quality and quantity.

**NAIRNSHIRE.** No wheat sown. *Barley*—30 bushels; grain 2 lb. heavier than last year; straw short, owing to extra dry season; seeding, 4 bushels. *Oats*—40 bushels; grain of average colour, owing to wet spell after cutting; seeding between 5 and 7 bushels; straw short, but of middling quality. *Harvest*—Started harvest about a fortnight earlier than usual. *Hay*—Of fairly good quality, but less than an average crop, owing to dryness of season; clover was thin—about 1 ton 5 cwt. per acre. No meadow-hay. *Potatoes*—A good crop, about 6 tons 10 cwt. per acre, of fine quality; disease almost unknown; no new varieties. *Turnips*—A full crop, especially swedes; quality good; about 20 tons of swedes per acre and 12 of yellows. Cabbage maggot did a great deal of havoc on plants, in some cases killing three-quarters of them. Nothing out of the usual injury by weeds. *Live Stock*—The poorest grass season on record, owing to protracted drought. Stock did well where there was grass for them; cattle and sheep very healthy. *Clip of wool*—Just an average.

**INVERNESS-SHIRE (Inverness).** *Wheat*—Quantity and quality of wheat better than previous year; 40 bushels about an average on best land; straw somewhat less than in 1907; grain superior. *Barley*—The yield per acre is similar to former year in grain, and the quality is better, but straw is less; yield about 38 bushels. *Oats*—The quantity is less than in 1907 both in straw and grain, but the quality of both is superior; about 40 bushels average yield. *Harvest* began earlier than usual about one week, and secured four weeks earlier than 1907. *Hay*—Average about 30 cwt. per acre for ryegrass and clover hay; quality excellent. *Meadow-*

*hay* less productive, but quality good. *Potatoes*—The yield was quite one-third more than in 1907, and the quality, when lifted, excellent, but the moist warm weather has caused sprouting in some cases. *Turnips*—Crop superior to last year in quality; average on best land from 20 to 25 tons per acre, and on light land from 15 to 20 tons; crop braided well, and although the weather was dry in autumn the yield was satisfactory. Very little damage by insects. Charlock among cereals was pretty bad on dry land, but not more than usual. *Live Stock*—Pastures average early, scanty in midsummer, and abundant in autumn. Stock thrived fairly well; cattle and sheep free from disease. *Clip of wool*—Quite an average in quantity and quality.

INVERNESS-SHIRE (Skye). *Oats* were a good average crop, and straw bulked much better than last year; 5 to 6 bushels sown. *Harvest* began fully a week earlier than last year. *Meadow-hay* was much better on damp meadows than last year, but on dry meadows much the same as last year. *Potatoes* were a better crop than last year, but owing to the very wet weather in September there was a lot of disease among them, but after all they weighed out better than the previous year; no new varieties planted. The *Turnip* crop, owing to having them put down earlier than last year, turned out a better crop; they braided well, and there was no resowing. No injury by insects or by weeds. *Live Stock*—Sheep having come well through the winter and spring came to the grass in good thriving condition, with the result that they thrived very well all through the season and came off the hills in good order; cattle and sheep free from disease. *Clip of wool*—Wool was fully up to the average in quality and weight.

INVERNESS-SHIRE (Lochaber). *Wheat*—None grown in this district. *Barley*—Very little grown. *Oats*—Average crop; seed, 6 bushels. *Harvest* began earlier—twenty days before last year. *Hay*—8 cwt. more than last year, and quality superior. *Meadow-hay*—Crop considerably more productive. *Potatoes*—15 cwt. more than last year; no disease; quality excellent; no new varieties. *Turnips*—2 tons increase; crop braided well; no renewed sowing needed. No injury by insects or weeds. *Live Stock*—Pastures during the season of average growth and quality with last year. Stock thrived well, and were free from disease. *Clip of wool*—Average.

ROSS-SHIRE (Dingwall and Munlochy District). *Wheat*—Almost none grown in district. *Barley*—Quality of grain rather over average; quantity of grain, say 34 bushels; quantity of straw under average, quality good; seed sown, say 4 bushels. *Oats*—Quantity of straw average, quality fine; quality of grain quite average; yield, 44 bushels; seed sown, 5 bushels. *Harvest* began 20th August—about the usual time. *Hay*—Quality below average; clover rather below average; weight, one-quarter ton; affected by early summer and the drought. *Potatoes*—Crop average; quality fine; weight about 6 tons; practically no disease. *Turnips*—Braided well; crop over average; very little finger-and-toe; yellows, 20 to 25 tons; swedes, 30 to 35 tons. *Live Stock*—Pastures, not so much growth, affected by drought in June and July. Stock thrived well considering shortness of pasture; cattle and sheep free from disease. *Clip of wool*—Average.

ROSS-SHIRE (Tain, Cromarty, and Invergordon District). *Wheat*—Good; full average; 3½ to 4 bushels. *Barley*—Average bulk; barely average quantity; good weight per bushel. *Oats*—On good land full crop; short

on dry soil. *Harvest* began a week later than usual—on last day of August. *Hay*—Less than last year; quality good; fair amount of clover; about  $1\frac{1}{2}$  ton. *Potatoes*—Larger; 8 to 9 tons; almost no disease; not so many new varieties tried. *Turnips*—Large; fine quality; fine braird; little or no fly; no re-sowing; yellow, 18 to 20 tons; swedes, 22 to 27 tons. Little injury from insects. Crops injured by sikeleys or charlock not more than usual. *Live Stock*—Pastures less growth by a good bit, owing to want of moisture, but stock did well. Stock thrived well; cattle and sheep quite free from disease. *Clip of wool*—Good quality, and rather over average quantity.

**SUTHERLANDSHIRE.** *Oats*—40 bushels; quality of grain and straw better as compared with last year, but owing to hot dry summer the bulk of straw was less than in the former year; quantity of seed sown, 6 bushels. *Harvest* began six to eight days earlier than in average years. *Hay*—Quantity and quality of clover hay better than the former year; quantity about 1 ton 5 cwt. per acre. *Meadow-hay*—About the same as regards bulk, but better in quality. *Potatoes* not grown to any extent; the quantity would be about 6 tons per acre; no disease, and quality very good. *Turnips*—This crop much better than last year; 18 to 20 tons per acre will be about the average; crop brairded well, and no second sowing required. *Live Stock*—On deep soils pastures were much better than last year, but on hard thin land were very much burned up. Stock thrived very well; cattle and sheep free from disease. *Clip of wool*—Good, and slightly over an average.

**CAITHNESS-SHIRE.** *Barley*—Good crop, but rains delayed the sowing in some cases till 13th May; grain in these cases was rather green; straw rank and twisted, or lodged with heavy rains in the early days of September. *Oats*—The season proved favourable, and the weather during last weeks of September and the month of October enabled the crop to be secured in excellent condition; rains followed; stooks were out in some places till December—steeped and soaked; the early secured threshes out well. *Harvest* began about the middle of September; the machines—manual or binder—had good weather and dry ground; rain in end of October and all November delayed the taking in till December in some rare cases. *Hay* crop was thinner and shorter than last year; the ryegrass did not bulk so well, but there was a fair aftermath; yield,  $1\frac{1}{2}$  ton. *Meadow-hay* was less, but was well harvested. *Potatoes*—Some nights' frost about middle of August blackened potato crop in some situations; those that escaped that frost produced a record yield of about 6 to 10 tons of good, mealy, fine-flavoured potatoes almost free of disease; Up-to-Dates, British Queen, and other varieties have been tried, but Champions are found most advantageous on the whole. *Turnips*—15 to 30 tons of turnip crop have been got; some rains battered the surface after sowing, and braird was delayed in getting through crust, but only one sowing was required; a fresh, open December helped bulbing, but a load clears a large space of ground. Grubs or leather-jacket thinned the oat crop to a much greater extent than last year; rough patches suffered most. Charlock, chickweed, thistles, coltsfoot, ragweed, selfheal, yellow rattle, knotgrass, sorrels, and docks are prevalent; the winged seeds need a systematic check, as winds waft them far and near. *Live Stock*—Pastures were of average growth and quality. Stock did fairly well, but sheep dropped some 3s. or 4s. in value. Dipping regulations seem to have stamped out sheep-scab, and there have been few or doubtful cases of anthrax in the county. *Clip of wool*—Quality of wool is good, but price has fallen.

**ORKNEY.** *Wheat*—None grown. *Bere*—A good crop, much better than last year; average yield, about 36 bushels, weighing 48 lb.; seed,  $3\frac{1}{2}$  to  $4\frac{1}{2}$  bushels. *Oats*—A fair good bulk of straw, although some less than last year, but a good grain crop—much better than last year; average yield, 32 bushels, weighing 40 lb. per bushel; seed, 4 to 6 bushels. *Harvest* began in the first week of October, being a week earlier than last year, and about a fortnight later than usual. The weather was the finest in the memory of the oldest, and the crops were secured in the very best condition. *Hay* was a better crop than last year, and was secured in the very best condition; average, about 22 cwt. per acre. *Potatoes*—A fair good crop; average, about 6 tons per acre. *Turnips*—A good crop; average, about 12 tons per acre; yellow turnips were, owing to the wet weather in June, sown rather late, but with fine weather all autumn they have grown to be a good crop. The grub did some damage to the lea oat crop. There was little injury done by weeds. *Live Stock*—Pastures were good at first, but bare later on; stock, however, thrived fairly well on them; cattle and sheep have been, with slight exceptions, free from disease. *Clip of wool*—The clip of wool was about an average.

**SHETLAND.** *Wheat*—No wheat in Shetland. *Barley*—No barley in Shetland to my knowledge. *Oats*—8 bushels; 1 bushel sown; 4 bushels above the average. *Harvest* began about two weeks before the usual time. *Hay*—We don't weigh hay crops here, but last year was much above the average of last seven years. *Meadow-hay*—More productive—about double. *Potatoes*—We never weigh them here, but they were above the average; there was no disease, and the quality was excellent. *Turnips*—We don't weigh them, but they were much above the average—about double. No injury by insects. Docks and chickweed, but damage much less than usual. *Live Stock*—Much above average. Stock thrived exceedingly well; cattle and sheep entirely free from disease.—*Clip of wool*—Good, and above the average.

## THE WEATHER OF SCOTLAND IN 1908.

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Scottish Meteorological Society.

THIS report consists of (1) a general description of the weather over Scotland from month to month; (2) a selection of rainfall returns, in which each county of Scotland is represented by one or more stations. It may be noted that all the temperature readings referred to are from standard thermometers exposed in "Stevenson Screens."

### JANUARY.

The mean temperature was  $37^{\circ}\cdot6$ , or  $0^{\circ}\cdot3$  above the normal, the days being  $0^{\circ}\cdot7$  above, the nights  $0^{\circ}\cdot1$  below, their respective averages. The opening days of the month were very cold, West Linton reporting a reading of  $10^{\circ}$  on 4th and Drumlanrig  $9^{\circ}$  on the following day. On 6th a sudden rise of temperature took

place under the influence of strong south-westerly winds, the morning reading on that day being higher than that of 5th by more than  $20^{\circ}$  at many places, and by as much as  $30^{\circ}$  at Balmoral. After a recurrence of colder weather, high readings prevailed about 17th, and thereafter rather mild conditions ruled until the end of the month. The extreme readings were  $59^{\circ}$  at Gordon Castle on 17th, and that already noted of  $9^{\circ}$  at Drumlanrig on 5th.

The mean rainfall was 3.92 inches, or 2 per cent above the normal. As generally happens in a winter month, the extremes were very great. Thus eastern districts experienced a shortage, but along a fairly wide belt between the Firths of Forth and Clyde there was a moderate, and towards the north-west a slight, excess. The month was the wettest of the year in Lochaber, but the driest of the year at Aberdeen. On 5th heavy falls occurred in western and central districts (2.65 inches at Lochbuie), and on 7th large amounts were general in the east, the Lothians and Border counties having more than 1 inch. The 7th, indeed, was the wettest day of the year in Edinburgh. After a short period of fine weather, heavy rains again occurred in many districts, especially towards west and north-west, Fort-William having an aggregate of more than 5 inches for the five days, 13th to 17th. The last week of the month was wet, except in some eastern districts, with some heavy falls on 25th and 26th.

Rather severe gales, usually from the south-west, were more or less general on 6th and 7th, from 15th to 17th, and during the last week. During the last few days of the month a heavy snowfall was experienced in the north.

Thunderstorms occurred in Orkney and Shetland on 26th; and towards the north-west on 27th or 31st.

Sunshine records were about the average.

## FEBRUARY.

The mean temperature was  $40^{\circ}.4$ , or  $2^{\circ}.2$  above the normal, the days and nights being above their respective averages by equal amounts. During a great part of the month decidedly mild conditions prevailed, and temperature variations were unusually moderate for the time of year. The opening days were, however, somewhat cold, and towards the close north-westerly winds were accompanied by cold and stormy weather. The highest reading for the month was  $56^{\circ}$  at Logie Coldstone and Crathes on 7th, and the lowest  $22^{\circ}$  at Bowhill (Ayrshire) on 28th and 29th.

The mean rainfall was 3.05 inches, or practically the normal. Even greater contrasts occurred than in January. In some

eastern districts the month was the driest of the year, some stations, such as Arbroath and Dundee, having aggregates of less than 1 inch. On the other hand, there was a decided excess towards north and west, amounting to fully 80 per cent at Dunrobin and fully 70 per cent at Nairn. At some north-western stations rain fell on every day of the month, Glencarron having a total of  $10\frac{1}{2}$  inches. Outside the North-West Highlands but little rain fell during the first half of the month, whilst the heaviest general falls occurred on 21st and 22nd, Fort-William having amounts of more than 1 inch on each of these days. Except in some eastern districts, rain, sleet, or snow fell daily from 21st onwards, Dunrobin registering 1·32 inch on 29th.

A severe westerly gale occurred on 22nd, with a thunderstorm in many districts. Snow at the beginning of the month was restricted chiefly to the north, but during the last two or three days a severe snowstorm was general, and by the afternoon of 29th the West Highland Railway was completely blocked on the Moor of Rannoch.

Sunshine was above the average, except in north and north-west, and, as was the case in February 1907, a great part of Scotland was much sunnier than the south of England. Thus Balruddery had an aggregate of 112 hours, and Aberdeen 106, but Bournemouth 73, and Jersey 68.

### MARCH.

The mean temperature was  $38^{\circ}\cdot3$ , or  $1^{\circ}\cdot3$  below the normal, the days being  $1^{\circ}\cdot8$  and the nights  $0^{\circ}\cdot7$  below their respective averages. Thus the month was much colder than February, though this was not the case in Orkney and Shetland. Temperature remained continuously low throughout almost the entire month, and especially during the first and third weeks. We may note that even at Leith the sheltered thermometer remained below  $40^{\circ}$  from 3rd to 6th, and on 18th and 19th, whilst at Balmoral it reached that level on only five days during the first three weeks. The 23rd was, as a rule, the warmest day, with a maximum of  $56^{\circ}$  at Nairn, Glasgow, Leith, and Dumfries, and thereafter rather milder conditions prevailed. The lowest reading experienced was  $10^{\circ}$  at Balmoral on 5th.

The mean rainfall was 4·55 inches, or 57 per cent above the normal. The month proved a very wet one in nearly all districts, and the wettest of the year over a great part of the Border counties. At Dundee it was the wettest March for at least forty years, and towards the north-east more rain fell than in January and February together. From 11th to 21st there were

many fine days, some districts being practically rainless during that period ; but, outside these dates, conditions were more or less unsettled. Some heavy falls occurred between 6th and 9th ; on 24th many widely scattered places, such as Dunrobin, Dundee, Edinburgh, Fort-William, and Colmonell had falls of more than 1 inch ; whilst towards the north-west, and also in central Perthshire, very heavy falls occurred during the last three or four days of the month, Bendamph on Loch Torridon registering 1·85 inch on 28th, and Stronvar  $1\frac{1}{2}$  inch on that day, and also on 30th.

There was a continuance in northern districts, during the first day or two, of the February snowstorm, and towards the end of the month snow and hail occurred in many districts. Gales were more or less general on 8th and 9th, on 22nd and 23rd, and from 28th to 31st.

Sunshine was deficient in most districts, but somewhat above the average in the north.

#### APRIL.

The mean temperature was  $41^{\circ}2$ , or  $2^{\circ}9$  below the normal, the days being  $3^{\circ}4$  and the nights  $2^{\circ}3$  below their respective averages. The month was notable for abnormally cold weather experienced, with winds from the north during the fourth week. In some districts actually the coldest night of the year occurred between 23rd and 25th, and minima of  $9^{\circ}$  at Perth on 24th and at Corstorphine on 25th are the lowest readings in the month of April in Scotland since observations were organised more than fifty years ago. The days also at this time were extremely cold, and at Edinburgh on 24th the sheltered thermometer rose only fractionally above the freezing-point, a remarkable occurrence for a day near the end of April. Almost the only moderately warm day of the month was the 17th, when readings of  $68^{\circ}$  were noted at Balruddery, Crieff, and Buchlyvie.

The mean rainfall was 1·79 inch, or 21 per cent below the normal. In general the amounts were much below the average, the deficiency in central Perthshire amounting to 50 per cent, but there was a slight local excess in the extreme north—in parts of Banffshire and Aberdeenshire, and in Mid-Lothian. A few stations, such as Strathpeffer, Dundee, and Crieff, had aggregates of less than 1 inch. From 11th to 22nd practically no rain fell in some inland and western districts, whilst the heaviest general falls occurred early in the month, on 8th, in the Edinburgh area on 23rd or 24th—when the precipitation consisted largely of snow—or on 30th. On 3rd Glencarron registered as much as 1·87 inch.

On the evening of 23rd a snowstorm of extraordinary severity for the advanced time of year set in over a great part of the country. Whilst some central and western districts reported no snow, or merely frequent showers, there was around Edinburgh a fall of several inches. In the South of England the storm was much more severe, and over our islands generally for some days, with winds from the north, conditions were of a very wintry character, for which there seems no parallel in official weather records for the month of April.

Sunshine varied in amount, being deficient towards south-east, normal in north-east and north-west, and above the average in Orkney, where the month was the sunniest of the year.

### MAY.

The mean temperature was  $50^{\circ}\cdot7$ , or  $1^{\circ}\cdot7$  above the normal, the days being  $1^{\circ}\cdot3$  and the nights  $2^{\circ}\cdot2$  above their respective averages. Thus a very cold April was followed by a mild May—on the whole the mildest May since 1901, and in great contrast to the same month of 1906 and 1907. Temperature was somewhat variable, but cold nights were infrequent, and towards the end of the month the weather was unusually mild—Kingussie, Perth, Buchlyvie, and Paisley reaching  $81^{\circ}$  on 28th. That was, as a rule, the warmest day of the month, but it should be noted that on the East Coast a decided fall of temperature occurred on the following day. The lowest reading reported was  $30^{\circ}$  at Balmoral and Kingussie on the night of 21st.

The mean rainfall was 2·39 inches, or 4 per cent above the normal. Towards the north-east a moderate deficiency prevailed, but in southern districts and in the extreme north there was a fairly well-marked excess. In many districts rain was rather frequent, though very heavy falls were rare. The heaviest general fall occurred on 8th, though the 30th was the wettest day in the Lothians. Generally speaking, rain fell almost daily from 1st to 12th, and frequently from 16th to 25th, whilst the last six days were rainless or all but so, except in east and south, where considerable falls took place on 30th.

On the night of 30th a rather severe thunderstorm occurred in east, south, and in some western districts, whilst earlier in the month thunder was noted on varying dates.

Sunshine was rather above the average, but deficient in Orkney.

Coast fog was rather frequent early in the month, and in east and north during the closing days.

## JUNE.

The mean for all the contributing stations was  $54^{\circ}9$ , or exactly the normal. The differences for the individual stations ranged from an excess of  $1^{\circ}9$  at Perth to a defect of  $1^{\circ}4$  at Fort Augustus, but many stations practically agreed with their normals. The month, however, included a considerable variety of temperature conditions. The first week experienced about an average share of warmth, the second was cold, and the third decidedly cold for the time of year, whilst the last few days were marked by bright, warm weather, a good many stations reaching  $80^{\circ}$  or over on some one day. The actually highest readings were  $87^{\circ}$  at Poltalloch on 28th, and  $85^{\circ}$  at Perth and Buchlyvie on 27th. Lowest readings occurred on varying dates, Kingussie reporting  $33^{\circ}$  on 5th, and Balmoral a similar reading on 12th and 15th.

The mean rainfall was 2.21 inches, or 12 per cent below the normal. Edinburgh had only half its average amount, and there was a decided shortage over the eastern half of the country, whilst towards west and south there was in general an excess. Almost the only heavy falls of the month occurred in the west on 10th, and in the south-east and south on 13th, when Langholm registered  $1\frac{1}{2}$  inch and Lochmaben  $1\frac{1}{2}$  inch. Some eastern districts entirely escaped heavy falls—Dundee, Arbroath, and Gordon Castle not registering as much as  $\frac{1}{4}$  of an inch on any one day. The last eight days of the month were rainless, or practically so, in nearly all districts.

Thunderstorms occurred at Kelso on 1st, and in south and west on 2nd, whilst thunder was heard here and there later in the month.

Coast fog in east and north from 1st to 3rd and from 25th to 29th; less generally in west and south.

The closing days were extremely sunny, but the aggregates for the month varied considerably, Edinburgh having a decided excess and Stornoway as decided a deficiency.

## JULY.

The mean temperature was  $57^{\circ}0$ , or  $0^{\circ}3$  below the normal, the nights being of average temperature and the days  $0^{\circ}6$  below. The first few days of the month saw a continuance of the bright warm weather which marked the closing days of June, and high temperatures prevailed on 1st, 2nd, and 3rd. On 2nd Dumfries reached  $91^{\circ}$  in shade, which appears to be the highest temperature officially recorded anywhere in the British Isles during the summer of 1908. We may note also as exceptional—readings

of 88° at Perth, Buchlyvie, and Paisley on the same day. These very warm days were succeeded by low readings on the night of 5th, when Balmoral reported 32°, and by about two weeks of rather cold weather, with an increase in warmth towards the close of the month.

The mean rainfall was 2·87 inches, or 8 per cent below the normal. Except for a considerable local excess between the Dee and the Don, northern districts had a rainfall much below the average, and in the extreme north-west the month was the driest of the year. Elsewhere there were various areas of decided excess, and in many eastern districts the month was the wettest of the year. The first week of the month was rainless in many districts, whilst from 8th to 17th conditions were very unsettled, with some heavy daily falls. On 17th Huntly registered more than 2 inches and Gordon Castle 1½ inch—the heaviest falls for the year at these places. From 18th onwards some districts were rainless, except for falls on 24th and 25th, whilst in others rain fell rather frequently after 20th.

Thunderstorms occurred on 2nd and 3rd, with heavy falls of hail in Perthshire. Coast fog was reported rather frequently.

On the nights of June 30th and July 1st, and more moderately on July 2nd, a remarkable sunset glow prevailed at midnight.

The early days of the month were extremely sunny, but cloudy weather followed, and the aggregates of bright sunshine were deficient in all districts.

### AUGUST.

The mean temperature was 55°·7, or 0°·9 below the normal, the days being 0°·6 and the nights 1°·2 below their respective averages. For about the first week or so temperature remained above the normal, the 2nd being very generally the warmest day of the month, whilst during the second week there were some unusually cold nights, minima of 30° occurring at Balmoral on 12th and 13th, and of 31° at Wick and Gordon Castle on the latter date. Thereafter, though the nights were fairly mild, the days were distinctly cold for the time of year. The highest temperatures reported were 82° at Buchlyvie on 2nd and 80° at Paisley and Dumfries on the same day.

The mean rainfall was 3·10 inches, or 16 per cent below the normal. Nearly all eastern and northern areas had a deficiency, which was most marked towards the south-east—Edinburgh having less than half the average,—whilst some western and southern districts reported an excess. In some parts of the country the first three weeks were almost continuously fine,

and almost the only important interruptions in any district occurred between 8th and 10th, when there were some very heavy falls in the north-west. The last ten days of the month were as a rule wet or very wet, and in some southern districts, especially in Galloway, the heaviest falls of the year occurred on 26th. The month closed with a rainstorm which only some northern districts escaped, and on 31st many falls of more than 1 inch were reported, Montrose registering as much as 1.60 inch.

Between 25th and 27th thunderstorms occurred over a wide area, and the closing days of the month were marked by stormy weather.

Fog was rather frequent in the north during the first three weeks, and the sunshine totals were slightly deficient towards the north, but above the average over a great part of the country.

#### SEPTEMBER.

The mean temperature was  $53^{\circ}0$ , or  $0^{\circ}2$  above the normal, the days being  $1^{\circ}0$  below and the nights  $1^{\circ}4$  above their respective averages. The month included a wide variety of conditions. The first two weeks were decidedly cold, Balmoral reporting a minimum of  $27^{\circ}$  on 5th, and Stronvar, Colmonell, and other stations  $30^{\circ}$  on 12th, whilst at the very end of the month there was an outburst of weather of extraordinary warmth for the advanced time of year. The night of the 29th was the mildest of the year in many districts, the minimum reading for that night at Leith being as high as  $63^{\circ}$ . This outburst of warm weather was associated with a very humid atmosphere. The highest reading of the month was  $74^{\circ}$  at Broomlands (Kelso) on 30th, a point touched also at Gordon Castle on 17th.

The mean rainfall was 4.90 inches, or 39 per cent above the normal. In many districts the excess amounted to fully 50 per cent, and at a few places, such as Nairn, Dundee, and Rothesay, the amounts approached twice the average. In the Border counties, however, the rainfall was a little below the average. Extremely heavy falls occurred between 5th and 8th. Thus on 5th, Glenquoich had nearly  $2\frac{1}{2}$  inches; on 7th, Greenock  $2\frac{1}{2}$  inches; and on 8th, Inverness 2.30 inches; and Novar as much as 3.20 inches. Considering the country as a whole, the 7th and 8th of September appear to have been the wettest days of the year. Considerable flooding took place in the north early in the month, and nearly everywhere harvesting operations were seriously interfered with by the heavy rainfall. The month was in great contrast to the fine September of 1907, and in all

districts the number of days with rain was unusually large, as many as twenty-eight at Stornoway and Arbroath.

Stormy weather prevailed at the beginning of the month, and about the 9th, and in general conditions were very unsettled. Thunder in several districts on 10th and towards the end of the month.

The sunshine records reflected the general character of the month, and were much below the average in all parts of Scotland. Aberdeen, with 67 hours, had little more than one-third as much sunshine as in September 1907 with 183 hours.

Fog was continuous in the Firth of Forth from 20th to 25th.

### OCTOBER.

The mean temperature was  $52^{\circ}6$ , or as much as  $6^{\circ}0$  above the normal, the days being  $5^{\circ}8$  and the nights  $6^{\circ}2$  above their respective averages. The outbreak of warmth at the end of September was the herald of what proved to be decidedly the mildest October for at least fifty years. The only cold weather occurred with north-easterly winds during the fourth week, and during the greater part of the month temperature maintained an unusually high level. The weather of the opening days was entirely abnormal. At Edinburgh the 1st was the warmest day of the year, and on that day Broomlands (Kelso) and Corstorphine reached  $79^{\circ}$  in the shade, whilst on 3rd Loanhead (Logie Coldstone) and Tillypronie reached  $81^{\circ}$ . Such high readings in October are unprecedented. The lowest readings reported were  $18^{\circ}$  at Balmoral on 25th, and  $19^{\circ}$  at Kingussie on 26th.

The mean rainfall was 1.82 inch, or 55 per cent below the normal, and considering Scotland as a whole, the month was the driest October on record, and in remarkable contrast to the very wet October of 1907. The month was extremely dry also in England and Wales and in Ireland. In parts of Berwickshire and Forfarshire there was a local excess, but considerable areas had only one-quarter or one-fifth of their normal rainfalls, and many stations aggregates of much less than 1 inch. The relative deficiency was most pronounced in the north-west and north. In general the number of days with rain was very small, some districts being rainless or all but so during the first half of the month, and nearly all quite rainless from 21st to 25th. Somewhat heavy falls, however, were experienced in north-west on 10th, and in some eastern districts on 18th or 19th. On 18th Montrose had more than 2 inches, and the 19th was the wettest day of the year at Aberdeen, with a fall of about  $1\frac{1}{4}$  inch.

Rather stormy weather prevailed on the north-west coast between 8th and 12th, and in the extreme north from 19th to 22nd.

A good deal of fog occurred at the beginning, middle, and end of the month.

Sunshine varied greatly in amount, Nairn with 125 hours having three times as much as Castlebay with only 41 hours.

### NOVEMBER.

The mean temperature was  $43^{\circ}\cdot9$ , or  $3^{\circ}\cdot0$  above the normal, the days being  $3^{\circ}\cdot1$  and the nights  $2^{\circ}\cdot9$  above their respective averages. Thus the month was a very mild one, though less conspicuously mild than October. The prevailing winds were from a southerly point, and the only cold weather experienced was between 6th and 10th, about 19th and 20th, or at the very end of the month, with shifts of wind from the southerly direction to east or north. The generally coldest weather was experienced on 9th and 10th. On 10th the sheltered thermometer at Perth did not rise above the freezing-point, and on the preceding night West Linton reported a minimum of  $16^{\circ}$ , which was decidedly the lowest temperature experienced anywhere during the month. Highest temperatures occurred on 1st, when Gordon Castle reached  $60^{\circ}$  in shade, about 12th, or on 28th.

The mean rainfall was 3·28 inches, or 14 per cent below the normal. The extreme north had rather more than its average rainfall, but nearly all other districts a deficiency, which was very decided towards north-east and south-east. Berwickshire had only about half its normal allowance of rain. In the south of Scotland practically no rain fell during the first nine days of the month, and but little elsewhere; but thereafter conditions were generally unsettled till near the end of the month, though towards both north-east and south-east there were many fine days.

The general absence of very heavy falls was noteworthy, but several western stations had more than 1 inch on 21st, and Stronvar more than 1 inch on both 24th and 27th. The accumulated rainfall of October and November was abnormally low.

Stormy weather was experienced in the north on 17th, and for several days from 22nd onwards gales were general. Thunderstorms occurred at widely scattered places between 20th and 25th.

Sunshine was in most districts of nearly average amount.

## DECEMBER.

The mean temperature was  $39^{\circ}3$ , or  $1^{\circ}2$  above the normal, the days being  $1^{\circ}5$  and the nights  $1^{\circ}0$  above their respective averages. The almost continuously mild weather for which the months of October and November were remarkable was prolonged, with but slight interruptions, until about 24th December, and temperature was frequently greatly above the average for the time of year. On 25th the wind shifted from the prevailing south-westerly direction to south-east, and later to east, and a short spell of severe cold set in. The lowest readings reported were  $10^{\circ}$  at Lednathie and  $12^{\circ}$  at Buchlyvie on 28th, and in no part of Scotland does the cold seem to have been so severe as that experienced at the same time in central England, where shade readings below or but little above zero occurred. On 31st a mild air current from south-west was again established. The warmest days of the month were from 20th to 22nd, the highest reading being  $56^{\circ}$  at Oban on 21st.

The mean rainfall was 3.67 inches, or 11 per cent below the normal, but the general distribution was very irregular. Some western districts had a slight excess, whilst in eastern districts and as far north as Dunrobin there was, as a rule, a decided shortage. Aberdeen, however, had an excess of as much as 60 per cent, and the month there was the wettest of the year, although at Edinburgh it was the driest. From 3rd to 22nd rain fell on every day at some western places, with some heavy amounts between 5th and 9th. In some north-western districts the 7th was the wettest day of the year, Bendamph (Loch Torridon) registering  $2\frac{1}{2}$  inches. On 11th, Deerness had almost  $1\frac{1}{2}$  inch. From 26th onwards precipitation took the form of snow, and, with heavy drifting, registration became a matter of difficulty. It appears certain, however, that towards the south-east the actual fall was but slight, whilst at Aberdeen the rainfall equivalent on 26th was more than 1 inch, and on 27th nearly 1 inch. During the month there was at Leith only one day with a fall of more than one-tenth of an inch, and towards the south-east generally the month's totals were only from 20 to 30 per cent of the average.

The continued deficiency of precipitation in some eastern districts during October, November, and December calls for comment. At Edinburgh the total rainfall for these months was the smallest registered during the last quarter of the year for at least half a century.

Gales were experienced between 7th and 12th, whilst from 26th to 30th weather of a very wintry type prevailed, a severe snowstorm becoming general on 27th. With strong winds from

south-east and east, the storm was of the nature of a blizzard, and for a day or two extensive snowdrifts completely disorganised the railway service in several districts. On 31st the snow had largely disappeared.

Thunderstorms at a few scattered places between 6th and 15th.

Coast fog in east early in the month and all round the coast, except to north-west, between 27th and 29th.

Sunshine varied in amount, Edinburgh having a slight excess, but Aberdeen only half its average.

#### *General Notes.*

On the whole, the outstanding features of the year may be said to have been, as regards temperature, the abnormally cold weather experienced in April, and the prolonged spell of very mild weather that prevailed with but brief interruptions from the end of September until well on in December. As regards rainfall, the heavy rains of March and September may be specially noted; also the extremely dry character of October, and the very small rainfall in Mid-Lothian during the last three months of the year.

## RAINFALL RECORDS FOR 1908 IN INCHES.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
<b>Shetland—Lerwick</b>	8.89	8.85	2.91	1.52	2.28	1.88	1.58	2.27	2.59	.96	4.12	8.82	80.68
<b>Orkney—Deerness</b>	8.41	4.26	4.89	2.28	2.73	2.86	1.87	2.55	2.68	1.52	4.35	4.08	87.78
<b>Caithness—Wick</b>	2.88	3.82	8.61	2.14	2.75	2.00	1.65	2.04	4.74	1.33	8.23	2.84	82.01
<b>Sutherland—Dunrobin</b>	8.37	5.05	4.84	2.31	2.33	2.25	1.95	1.56	2.69	.86	3.57	1.82	88.10
<b>Altaharra</b>	4.26	7.24	4.05	2.06	2.23	2.37	1.30	1.71	5.94	1.56	5.42	5.71	42.76
<b>Ross and Cromarty—</b>													
Strathpeffer	2.90	4.12	3.33	.97	1.58	1.23	.81	1.81	4.06	.65	3.11	2.98	27.50
Glencarron	10.44	10.31	6.20	5.05	3.84	6.03	2.16	5.35	11.06	1.96	9.27	8.37	80.02
Bendamp	11.20	10.97	12.13	4.21	3.27	6.87	2.43	6.26	11.91	3.20	10.08	18.08	95.41
Stornoway	5.75	5.89	6.19	2.88	2.57	2.38	1.37	2.82	6.31	2.78	6.58	7.08	52.90
<b>Inverness—Inverness</b>	1.83	3.39	3.69	.96	.95	1.26	1.54	1.82	5.04	.51	2.33	1.98	25.25
Kingussie	2.55	2.28	5.06	1.77	1.36	1.76	2.00	2.18	4.50	.52	2.88	1.79	28.65
Drumnadrochit	8.74	4.75	5.36	1.55	1.89	1.44	1.70	2.69	6.20	.67	3.39	3.80	86.08
Glenquoich	14.53	14.70	11.65	3.82	5.61	5.81	4.66	8.81	11.32	2.88	11.55	12.56	107.40
Fort William	11.02	7.95	7.83	2.44	4.31	4.79	3.90	6.70	8.30	2.17	6.44	10.47	76.82
<b>Nairn—Nairn (Delnies)</b>	2.24	2.75	2.78	1.09	1.29	1.37	1.09	1.83	4.57	.42	2.39	1.31	22.96
<b>Elgin—Gordon Castle</b>	1.76	1.81	3.35	2.63	1.17	1.23	2.98	2.82	4.55	.65	1.86	1.27	25.38
<b>Banff—Banff (Earl Hill)</b>	1.64	1.57	3.34	1.75	1.37	1.47	2.74	1.71	8.50	.79	1.65	2.96	24.34
<b>Aberdeen—New Deer</b>	1.71	1.63	3.65	2.32	1.87	2.01	2.39	2.00	8.29	1.31	1.63	3.72	27.08
Aberdeen	1.16	1.17	3.54	1.88	1.51	2.09	2.17	2.26	3.33	2.60	1.89	4.88	27.98
Tillypronie	2.01	2.62	4.70	3.41	1.42	1.37	4.86	3.05	3.99	1.32	1.52	2.45	82.72
Balmoral	1.84	2.80	4.10	2.56	1.42	.82	1.83	2.14	3.01	1.61	1.91	3.11	26.15
<b>Kincardine—The Burn</b>	2.74	.98	4.79	1.82	1.82	1.23	2.46	2.78	4.04	3.62	2.56	3.14	32.48
<b>Forfar—Montrose</b>	1.81	1.02	3.30	1.23	1.54	1.04	1.65	3.33	3.84	4.04	1.66	2.58	27.34
Dundee	1.61	.60	3.38	.82	1.82	1.06	1.95	2.75	4.30	2.81	1.68	1.61	25.39
Forfar	1.91	1.04	3.82	.84	1.54	1.18	1.81	3.25	4.02	3.40	2.06	4.00	28.87
Lednathie	2.68	1.01	5.42	.85	2.04	2.21	2.99	3.78	4.62	7.30	3.18	4.42	40.50
<b>Perth—Perth</b>	1.89	1.28	3.97	.92	1.86	1.68	2.11	2.93	3.96	2.33	2.40	2.08	27.41
Guthrie	4.44	2.56	5.34	1.18	2.43	1.70	2.72	3.69	5.68	3.28	3.50	4.08	40.45
Stronvar	9.09	5.07	8.40	1.63	3.38	3.98	5.58	6.24	10.15	2.74	7.87	9.76	73.33
Dunne	4.26	2.89	8.76	1.28	2.81	2.07	2.85	3.71	5.64	1.34	3.47	8.45	86.98
Aberfoyle	6.10	3.75	5.25	1.55	1.65	4.20	4.40	6.25	9.95	2.20	5.80	7.65	87.15
<b>Fife—St Andrews</b>	1.77	.76	8.87	1.07	1.76	.95	2.10	2.95	3.95	3.37	1.96	1.32	25.83
<b>Kinross—Loch Leven</b>	4.59	1.92	4.15	1.38	1.60	1.67	3.28	1.98	8.02	2.61	3.83	2.12	87.75
<b>Clackmannan—Dollart</b>	4.61	2.02	4.59	.90	2.97	1.76	3.74	3.33	7.16	1.96	3.35	2.25	38.68
<b>Argyll—</b>													
Lochbuie (Mull)	9.46	8.97	10.20	3.52	4.68	4.71	7.27	5.26	13.97	3.19	6.66	11.92	87.90
Tighnabruich	6.95	13.14	7.47	2.18	3.25	3.84	6.11	6.25	8.82	2.08	5.09	7.17	72.85
Ardishaug	7.39	6.69	7.12	2.03	3.55	3.77	5.09	6.46	7.83	3.12	6.58	7.87	66.00
Inverary	9.67	6.18	6.62	2.88	4.28	4.13	5.79	7.35	11.12	1.47	6.34	5.70	74.68
Campbeltown	4.51	3.36	5.63	3.91	1.86	2.82	3.75	3.90	5.90	2.12	4.52	5.96	48.24
<b>Bute—Rothesay</b>	5.88	4.59	6.05	2.11	2.72	3.73	3.95	4.15	8.45	2.30	5.22	7.13	55.68
<b>Stirling—</b>													
Stirling (Polmaise)	4.22	2.40	3.95	1.45	2.65	1.65	3.06	4.61	4.70	2.55	2.70	3.29	37.41
Buchlyvie	6.42	3.46	4.91	1.37	3.67	2.75	3.85	4.38	7.59	1.60	4.06	5.73	49.79
<b>Dumbarton—</b>													
Dumbarton	6.08	3.30	5.11	1.51	2.18	2.56	3.12	4.90	5.53	1.64	4.24	6.04	46.21
Rochester House	10.80	7.80	9.20	2.50	4.20	4.70	7.00	7.95	13.10	2.95	8.40	10.05	88.45
<b>Renfrew—Greenock</b>	9.85	4.87	7.00	2.01	3.31	3.87	4.40	5.57	9.53	1.50	5.49	7.98	65.18
Paisley	6.03	3.48	5.33	1.43	2.93	3.13	2.68	3.54	5.25	1.71	3.47	4.29	43.27
<b>Ayr—</b>													
Kilmarnock Ag. Col.	5.16	2.94	4.06	1.98	2.62	2.62	2.81	4.01	5.10	.97	3.54		
Doonholm	5.14	2.79	4.31	1.39	2.29	2.88	3.18	3.71	4.88	.88	4.11	3.84	37.90
Colmonell	4.79	4.08	5.38	1.80	1.85	2.87	2.97	3.54	4.84	1.70	4.78	5.85	44.15
<b>Lanark—</b>													
Glasgow (Observatory)	4.28	3.31	4.21	1.58	3.16	2.56	2.22	3.12	4.74	1.92	3.76	3.08	35.84
Lanark	3.60	3.10	4.50	1.50	1.90	1.80	2.50	2.10	4.70	.50	2.30	1.50	29.80
Lamington	4.53	3.23	5.73	1.30	2.92	1.99	2.09	2.86	5.21	.90	3.07	1.74	35.37
Leadhills	5.28	3.44	7.07	1.70	3.16	4.11	4.68	5.20	10.01	1.71	4.63	4.69	55.88
<b>Midlothian—</b>													
Linton—Polkemmet	5.51	3.26	5.27	2.31	3.66	3.02	5.01	5.10	7.88	1.80	5.16	3.21	51.19
<b>Edinburgh (University)</b>	2.72	1.08	3.06	1.76	2.04	.96	3.54	1.64	2.66	1.23	1.53	.46	22.63
<b>Haddington—</b>													
Aberlady	2.19	.87	2.62	1.52	2.00	.77	2.42	1.49	2.80	.93	1.68	.19	19.48
Whittingehame	2.71	.78	3.26	1.74	2.33	1.00	3.21	1.11	3.45	1.38	1.53	.46	33.45
<b>Berwick—Duns Castle</b>	2.25	1.99	4.29	1.88	2.52	1.31	4.05	1.88	2.37	3.51	1.30	.58	37.58
<b>Peebles—Peebles</b>	3.11	2.51	5.17	1.66	3.18	1.52	1.69	2.03	4.46	1.36	1.90	.77	29.36
<b>Selkirk—Clovenfords</b>	3.50	2.40	5.95	1.27	2.18	1.38	2.51	3.13	3.18	1.90	1.98	1.17	30.43
<b>Roxburgh—St Boswells</b>	2.80	1.17	3.80	.94	2.59	1.18	2.36	1.67	2.72	1.83	1.33	.60	23.77
<b>Kelso (Broomlands)</b>	1.65	1.82	3.04	1.16	2.08	1.33	3.80	1.78	1.66	1.73	1.16	.43	30.38
<b>Dumfries—Dumfries</b>	4.11	2.90	4.66	1.75	3.39	2.53	3.03	3.91	3.58	1.88	2.27	3.21	37.22
Drumlanrig	4.70	3.42	6.42	1.50	2.75	3.34	3.47	3.76	6.27	.84	3.50	4.24	44.21
Moffat	5.82	3.18	5.84	1.37	3.45	3.16	2.50	3.70	7.08	1.99	3.80	3.21	45.66
Langholm	6.78	2.59	7.02	2.25	3.85	3.62	4.01	7.03	6.29	4.24	3.81	3.33	54.72
<b>Kirkcubright—Cargen</b>	5.02	3.87	5.31	2.35	3.98	3.19	4.20	4.91	4.99	2.19	2.97	4.19	46.66
Cally	3.67	3.33	4.91	2.05	3.44	3.84	4.68	5.43	4.84	2.83	3.65	3.16	49.17
Daly	3.89	3.67	3.01	2.22	3.35	3.81	4.55	4.81	7.20	2.33	3.82	7.99	66.26
<b>Wigtown—Galloway Hse</b>	3.77	3.08	3.94	2.30	2.85	1.99	2.98	3.93	3.73	2.35	3.24	4.48	36.13

AGRICULTURAL STATISTICS.—RETURNED UPON 4TH JUNE 1908—(Compiled from the Government Returns.)  
TABLE NO. 1.—ACREAGE UNDER CROPS AND GRASS IN EACH COUNTY OF SCOTLAND.

Counties.	Total Acreage under Crops and Grass.*		CORN CROPS.										Total		Turnips or Swedes.		Mangels.		Cabbage.		Rape.		Vetches or Tares.		Small Fruit.		Clover, Balinot, and Grasses under Rotation.		Other crops.		Bare Fallow.		
Arable Land.	Acres.	Acres.	Wheat.	Barley or Bere.	Oats.	Rye.	Beans.	Pears.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	
1. Aberdeen	593,508	35,015	20,061	188,132	233	505	358	209,289	7,705	85,990	9	169	83	2,917	351	285,924	257	414															
2. Antrim	123,517	55,707	1,307	16,924	443	64	2	18,830	3,985	5,611	47	109	110	19	89	26,544	63	468															
3. Argy.	518,783	159,253	5,545	42,857	81	1,151	51	45,445	9,684	6,160	521	469	170	20	298	66,920	185	114															
4. Banff	160,135	150,938	8,220	45,851	68	104	51	57,125	2,012	11,323	12	18	9	880	8	69,233	10	66															
5. Berwick	122,131	50,036	1,773	18,783	31,596	13	576	23	52,764	2,542	26,461	172	408	548	32	59,648	10	63															
6. Breck	25,625	16,061	26	4,623	69	32	7	4,769	975	1,295	14	13	82	3	60	7,424	66	364															
7. Caithness	111,894	83,274	936	32,023	..	460	2	32,983	1,585	12,541	..	4	27	67	17	26,238	1	171															
8. Clackmannan	115,544	9,451	3,059	31	13	460	2	4,110	307	766	..	4	207	47	44	3,901	19	258															
9. Dumfriesshire	27,668	21,502	483	6,879	28	87	5	7,544	2,287	1,331	19	207	47	44	59	15,869	28	133															
10. Dundee	49,070	183,258	21,502	483	65	25	136	31,788	6,920	10,353	60	702	792	180	235	29,315	392	35															
11. Edinburgh	126,691	80,702	4,987	21,286	532	23	11	35,487	1,964	14,832	9	7	16	271	16	89,610	15	159															
12. Elgin or Moray	100,278	7,942	394	23,266	532	23	11	35,487	1,964	14,832	9	7	16	271	16	89,610	15	159															
13. Fife	248,528	76,648	9,207	20,049	1,139	960	21	69,961	16,005	22,766	45	436	366	565	247	65,031	109	698															
14. Forfar	321,524	26,904	7,805	27,430	48,569	852	282	43	84,981	16,418	32,504	40	226	32	323	412	86,163	143	83														
15. Fordington	111,938	91,451	20,172	16,381	168	412	91	36,973	8,887	14,530	153	529	243	165	353	26,798	404	124															
16. Inverness	85,983	64,005	92	7,158	29,666	703	1	37,925	6,085	10,371	8	68	6	98	26	30,380	15	531															
17. Kinross	119,429	11,468	613	12,848	26,590	34	215	42	89,842	6,520	10,561	..	22	6	358	184	47,347	66	1														
18. Kirkcudbright	35,383	22,952	13,351	6,079	106	30	..	6,632	769	2,507	..	60	207	1,073	15	50,141	62	142															
19. Leven	192,013	90,150	101,858	24	36	25,326	25	18	3	25,432	1,579	11,397	86	207	1,073	15	50,141	62	142														
20. Leven	58,749	141,945	1,697	36,996	24	435	7	39,419	5,001	9,434	23	1,123	1,047	123	2,259	82,698	421	266															
21. Louthgow	53,941	84,651	3,507	10,078	90	282	4	14,545	2,368	8,485	9	190	207	129	72	13,557	11	106															
22. Nairn	26,124	2,154	4,336	5,036	96	..	5	8,787	324	4,149	3	0	..	..	..	9,594	8	79															
23. Orkney	107,595	89,879	18,016	..	..	..	..	4,336	5,036	96	..	5	10	7	394	374	9,333	2	81														
24. Peebles	48,749	27,716	109,563	4,332	10,278	1,589	22	58,556	3,774	8,633	2	81	588	99	94	84,865	21	172															
25. Perth	386,973	227,416	109,563	4,332	10,278	1,589	22	58,556	3,774	8,633	2	81	588	99	94	84,865	21	172															
26. Perth	90,089	45,681	1,469	36	16,357	8	187	20	12,056	2,998	2,685	32	375	38	263	2,761	97,983	84	1,200														
27. Rose & Cromarty	140,634	110,851	29,608	1,167	10,765	20,357	533	2	11	42,560	7,414	15,888	49	177	8	409	33	44															
28. Ross	29,036	16,767	13,899	..	265	4,610	..	..	..	4,575	197	2,491	..	36	90	46	6	7,968															
29. Selkirk	58,007	16,453	41,624	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..															
30. Shetland	116,449	62,376	54,178	1,424	1,841	7,705	41	2,831	1	9,047	2,793	13	258	218	161	158	29,061	528	1,065														
31. Stirling	31,522	8,679	784	1,783	86	3	4	8,669	1,493	3,921	13	15	36	25	2	5,555	2	166															
32. Sutherland	156,968	116,448	86,925	144	596	24	179	2	82,310	1,418	14,392	334	146	139	18	69,006	48	235															
33. Wigtown	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..															
Total	4,866,473	3,389,831	1,474,142	948,513	5,951	10,247	903	1,306,520	143,692	440,993	1,980	7,914	7,550	7,063	7,930	1,553,692	2,798	8,261															

\* Not including mountain and heath land.

TABLE No. 2.—TOTAL PRODUCE OF WHEAT, BARLEY, AND OATS, AVERAGE AND YIELD per Acre in the Year 1907, compared with the YIELD for the Years 1906 and 1905, and the AVERAGE of the Ten Years, 1897-1906, in each COUNTY of SCOTLAND.

COUNTIES.	WHEAT.				BARLEY, INCLUDING BEER.				OATS.			
	Total Produce in 1907.	Acreage in 1907.	Yield per acre.			Total Produce in 1907.	Acreage in 1907.	Yield per acre.			Total Produce in 1907.	Acreage in 1907.
			Yield per acre.					Yield per acre.				
			1907.	1906.	1905.			1907.	1906.	1905.		
Aberdeen	Qrs. 34	Acreage 9	Bush. 30.23	Bush. 37.75	Bush. 31.06	Qrs. 98.131	Acreage 25,017	Bush. 81.38	Bush. 33.04	Bush. 34.43	Qrs. 832,170	Acreage 168,081
Argyll	..	..	..	..	..	6,538	1,490	34.03	36.59	30.99	31,252	34.34
Ayr	4,613	829	44.50	46.59	48.08	8,579	1,751	38.13	36.64	41.64	31,252	34.34
Bang.	83	82	31.24	38.00	34.69	4,030	9,093	33.72	37.14	35.12	44,311	48.01
Berwick	8,630	1,810	85.15	40.70	39.41	84,931	19,088	25.29	32.60	42.89	47,908	46.19
Bute	4	1	32.00	..	..	84,103	80	27.57	33.83	31.06	40,361	46.19
Caithness	..	..	..	..	..	8,065	846	28.98	30.77	30.68	32,668	37.88
Clackmann.	1,319	240	43.97	44.16	42.09	1,609	339	35.01	36.05	35.33	32,459	30.27
Dumfries	2,488	594	35.51	37.64	35.99	2,655	542	32.47	32.41	36.36	30,268	37.01
Dumfriesshire	30,684	5,805	46.20	47.20	51.49	25,112	11,896	41.55	42.85	45.32	36,926	38.08
Edinburgh	3,217	500	40.27	40.37	45.45	25,416	11,896	37.55	32.40	40.56	31,235	6,926
Elgin or Moray	53,612	10,693	36.22	38.14	43.73	95,975	20,445	35.70	40.10	40.56	163,805	41,908
Fife	38,699	8,503	44.88	43.15	46.15	79,351	15,052	42.17	39.11	44.15	212,566	43,908
Forfar	27,896	5,204	44.59	45.25	42.32	23,134	7,015	26.40	26.10	36.29	208,641	38,633
Glasgow	396	77	44.59	45.25	42.32	23,134	7,015	26.40	26.10	36.29	274,239	47,466
Inverclyde	2,766	620	35.35	37.01	37.11	52,228	13,725	30.44	33.18	35.07	99,724	17,271
Inverness	323	62	41.67	41.43	36.70	1,968	405	36.90	38.52	37.90	113,001	29,554
Kilbride	105	26	32.31	34.16	34.66	34,801	308	28.77	35.80	32.31	120,374	26,101
Kirkcubright	7,332	1,855	31.12	33.14	36.81	35,552	2,538	43.07	40.89	42.29	36,839	37.29
Kilmory	9,040	1,649	43.85	43.04	48.15	42,992	3,219	32.64	31.62	25.90	36,839	37.29
Lanark	34	8	34.00	..	..	13,134	4,318	37.42	33.22	33.11	109,155	26,021
Lanarkshire	..	..	..	..	..	14,781	4,318	37.42	33.22	33.11	109,155	26,021
Leith	..	..	..	..	..	1,324	336	31.52	32.58	33.94	33,565	37,401
Orkney	..	12	36.00	..	..	45,206	11,669	29.62	35.40	40.32	33,565	37,401
Perth	22,688	5,396	33.64	38.48	40.13	39,320	8,669	31.02	35.40	40.32	33,565	37,401
Renfrew	6,509	1,506	34.58	39.17	42.24	185	36	41.03	38.83	44.32	33,565	37,401
Ross and Cromarty	3,880	966	32.13	27.81	23.88	98,988	45,069	31.29	29.45	25.97	83,533	90.13
South Ayrshire	2,859	496	38.15	36.73	34.58	33,377	11,181	35.97	32.37	36.48	93,899	46.50
South Scotland	..	..	..	..	..	50,267	11,181	35.97	32.37	36.48	93,899	46.50
Selkirk	..	..	..	..	..	682	172	31.74	29.85	30.00	93,899	46.50
Shetland	..	..	..	..	..	4,145	1,381	24.03	22.96	25.54	93,899	46.50
Stirling	9,324	1,551	48.10	43.84	46.92	59,225	2,412	39.30	36.58	39.93	83,533	90.13
South Scotland	32	8	32.00	..	..	11,850	908	32.56	34.62	35.65	83,533	90.13
Wigtown	902	223	30.96	32.75	31.67	2,007	406	39.55	34.92	30.46	93,899	46.50
Total	295,600	45,907	85.18	39.95	42.46	904,714	210,909	34.41	34.59	37.78	4,385,912	951,011

↑ Average of 7 years only.

\* Average of 8 years only.



TABLE No. 4.—TOTAL PRODUCE OF TURNIPS (including SWEDS) and MANGELS, ACREAGE and YIELD per Acre in the Year 1907, compared with the YIELD for the Years 1906 and 1905, and the AVERAGE of the Ten Years, 1897-1906, in each COUNTY of SCOTLAND.

COUNTIES.	TURNIPS.					MANGELS.				
	Total Produce in 1907.	Acreage in 1907.	Yield per Acre.			Total Produce in 1907.	Acreage in 1907.	Yield per Acre.		
			1907.	1906.	1905.			1907.	1906.	1905.
	Tons.	Acres.	Tons.	Tons.	Tons.	Tons.	Acres.	Tons.	Tons.	Tons.
Aberdeen . . . . .	1,203,487	86,890	13.86	17.00	13.28	328	32	10.25	11.36	12.92
Argyll . . . . .	58,308	5,617	10.38	14.30	13.96	65	65	6.43	9.20	10.12
Ayr . . . . .	98,137	6,663	14.73	20.69	18.72	10,684	678	15.73	22.18	24.11
Banff . . . . .	276,746	21,553	12.84	19.85	15.06	86	4	9.00	14.50	19.09
Berwick . . . . .	486,576	25,974	18.78	20.40	17.19	5,861	254	21.11	21.51	24.76
Bute . . . . .	13,339	1,386	9.62	17.54	16.01	272	24	11.33	22.87	16.86
Caithness . . . . .	224,179	13,116	17.09	20.26	19.59	..	..	..	..	..
Clackmannan . . . . .	7,136	778	9.17	11.02	12.76	24	4	6.00	10.00	10.00
Dumfries . . . . .	16,352	1,379	11.86	19.29	20.44	193	18	10.72	16.18	17.46
Dumfriesshire . . . . .	226,670	17,490	12.96	12.80	14.27	4,408	405	10.88	16.10	14.03
Edinburgh . . . . .	195,225	11,065	17.66	19.34	18.31	1,540	81	19.01	24.76	22.16
Elgin or Moray . . . . .	249,007	14,986	16.67	18.93	19.94	98	7	14.00	13.11	19.00
Fife . . . . .	329,969	32,297	14.14	16.05	14.38	98	73	9.44	10.17	10.40
Gorrie . . . . .	536,794	32,431	16.55	18.86	18.14	689	21	12.81	15.03	14.86
Haddington . . . . .	284,435	14,917	19.07	19.08	18.24	969	21	20.50	20.04	19.68
Inverness . . . . .	188,531	10,536	17.89	20.03	18.69	5,247	256	20.50	20.04	19.19
Kincardine . . . . .	216,077	16,805	12.86	14.13	13.44	268	14	19.14	25.17	24.29
Kinross . . . . .	28,764	2,488	10.78	12.24	14.10	..	..	..	15.00	..
Kirkcubright . . . . .	170,984	12,011	14.16	17.04	17.41	25	3	8.33	8.71	8.00
Leamark . . . . .	131,984	9,733	13.53	16.05	17.99	1,870	108	17.31	23.37	18.20
Linlithgow . . . . .	58,535	3,518	16.64	18.49	17.71	168	24	7.00	8.61	9.23
Nairn . . . . .	65,662	4,152	15.81	16.82	14.31	325	21	15.48	16.00	13.36
Orkney . . . . .	136,770	14,303	9.56	10.97	6.55	64	4	16.00	17.00	15.00
Perth . . . . .	44,359	3,702	17.38	18.31	6.55	1..	19	1..	1..	1..
Perthshire . . . . .	495,216	27,641	17.92	16.57	21.10	58	3	19.83	..	20.00
Rearrow . . . . .	23,692	2,900	13.01	19.37	17.73	1,067	49	21.78	18.79	15.33
Ross and Cromarty . . . . .	92,481	15,438	3.99	7.39	6.92	630	51	12.85	14.59	12.94
Roxburgh . . . . .	294,857	20,505	14.38	13.76	15.98	441	68	6.49	8.20	7.99
Sal Kirk . . . . .	50,604	2,542	12.00	15.00	17.00	783	59	12.42	20.82	17.83
Shetland . . . . .	24,115	1,553	12.00	12.92	12.10	..	..	..	..	..
Stirling . . . . .	66,283	4,042	16.96	19.25	14.48	194	15	12.93	24.47	14.18
Strathclyde . . . . .	50,650	2,987	16.96	7.48	17.25	..	..	..	..	..
Sutherland . . . . .	200,819	14,625	13.73	19.20	19.15	..	..	..	..	..
Wigtown . . . . .	..	..	..	..	..	..	..	..	..	..
Total . . . . .	6,538,045	344,202	14.65	16.90	16.08	42,269	432	15.14	19.44	18.94
										17.42

\* Average of 8 years only.

† Average for 7 years only.

‡ 12 acres of Turnips originally returned in error in the county of Caithness as Mangels now included in Turnips.

† Crop failed.

TABLE No. 5.—TOTAL PRODUCE OF HAY from Clover, Sainfoin, and Grasses under Rotation, also Total from Permanent Pasture, AVERAGE, and YIELD per Acre in the Year 1907, compared with the YIELD for the Years 1906 and 1905, and the AVERAGE of the Ten Years, 1897-1906, in each COUNTY of SCOTLAND.

COUNTIES.	FROM CLOVER, SAINFOIN, AND GRASSES.					FROM PERMANENT PASTURE.					
	Total Produce in 1907.	Acreage in 1907.	Yield per Acre.			Total Produce in 1907.	Acreage in 1907.	Yield per Acre.			
			1907.	1906.	1905.			1907.	1906.	1905.	
	Tons.	Acres.	Gwt.	Gwt.	Average of the Ten Years, 1897-1906.	Tons.	Acres.	Gwt.	Gwt.	Average of the Ten Years, 1897-1906.	
Aberdeen . . . . .	68,144	48,858	27.89	27.62	28.03	2,512	2,481	20.25	16.40	21.27	18.08
Argyll . . . . .	18,663	11,854	31.39	30.91	29.62	27,884	16,576	33.64	33.33	31.27	29.85
Ayr . . . . .	59,528	33,917	35.10	34.37	34.45	37,489	16,911	44.34	43.47	43.63	39.78
Banff . . . . .	14,692	10,359	22.36	22.31	22.36	217	217	15.81	17.23	17.38	19.58
Berwick . . . . .	19,749	9,688	40.98	41.06	42.78	2,532	1,564	32.88	30.06	32.81	28.15
Bute . . . . .	4,462	2,326	38.28	40.31	35.41	1,355	689	39.33	32.81	41.30	30.69
Caithness . . . . .	10,394	9,619	21.49	23.52	17.58	1,323	1,700	15.57	15.86	14.52	8.20
Clackmannan . . . . .	4,428	1,974	44.86	42.29	38.01	1,193	616	38.74	34.81	31.55	29.84
Dumfriesshire . . . . .	12,270	6,949	35.32	36.78	36.81	1,193	1,609	29.02	31.97	31.98	38.35
Dumfries . . . . .	23,053	19,152	24.07	24.23	20.98	2,394	1,609	30.09	29.72	26.48	38.35
Dumfries & Galloway . . . . .	41,966	13,446	62.42	61.91	59.06	8,005	1,830	33.03	36.03	34.40	38.56
Edinburgh . . . . .	9,758	5,987	32.60	34.98	26.98	414	343	24.13	21.64	21.39	28.46
Elgin or Moray . . . . .	56,380	27,538	40.95	34.93	32.61	7,479	4,078	36.68	30.60	25.36	28.03
Fife . . . . .	34,260	18,732	34.72	34.92	36.04	1,761	1,455	24.30	25.80	23.13	22.99
Forfar . . . . .	32,895	10,667	61.68	61.36	54.73	1,962	1,133	34.64	34.97	30.93	29.63
Galloway . . . . .	16,696	11,115	30.04	29.19	25.90	8,451	6,837	24.73	23.74	24.87	31.46
Kincardine . . . . .	19,436	13,405	29.00	28.41	26.88	1,600	235	13.62	14.02	14.75	17.43
Kirkcubright . . . . .	5,588	2,871	38.93	36.06	32.35	1,898	711	39.18	35.59	32.41	33.00
Kirkcubright . . . . .	14,840	9,563	31.04	31.33	28.35	16,375	12,185	26.83	26.32	25.26	25.79
Lennox . . . . .	39,665	33,628	36.07	39.71	33.82	19,287	8,468	51.34	36.93	37.85	35.11
Leithgow . . . . .	24,303	7,784	62.44	68.52	57.09	1,494	948	35.53	35.58	33.44	33.53
Nairn . . . . .	1,938	1,781	22.39	23.43	16.78	117	134	17.62	16.13	13.00	14.92
Orkney . . . . .	6,838	8,121	16.82	19.36	18.83	267	643	8.93	8.94	10.88	9.60
Perth . . . . .	5,147	3,603	39.55	39.05	32.12	1,366	899	30.17	31.60	32.82	31.85
Perth & Kinross . . . . .	47,037	32,659	38.53	38.93	36.21	12,580	11,851	21.27	25.92	23.78	23.78
Perth & Kinross . . . . .	36,468	14,708	55.99	40.50	39.14	7,856	4,478	35.09	36.46	41.69	45.15
Perth & Kinross . . . . .	11,844	18,870	17.07	16.58	14.85	876	2,569	6.33	6.01	6.95	4.95
Perth & Kinross . . . . .	15,231	8,318	36.62	38.56	32.57	11,762	7,330	32.14	32.36	27.28	28.84
Perth & Kinross . . . . .	1,868	944	40.00	40.62	30.00	1,491	1,660	30.00	30.00	30.00	27.92
Perth & Kinross . . . . .	1,074	1,184	18.14	12.87	18.51	2,490	1,689	14.46	13.03	14.11	14.91
Perth & Kinross . . . . .	27,256	13,740	39.67	38.45	32.32	10,862	6,898	36.84	39.39	25.70	38.44
Perth & Kinross . . . . .	3,689	4,160	17.73	15.97	15.80	1,608	1,170	14.57	13.58	15.64	8.62
Perth & Kinross . . . . .	8,795	4,744	37.08	43.48	33.02	4,403	4,715	19.06	27.88	21.06	21.06
Total . . . . .	718,280	422,195	34.03	34.68	31.19	216,163	*143,011	30.23	30.69	28.46	29.59

\* This Acreage is less than that stated in some other Tables by 716 acres, which were originally returned for the county of Orkney as "Grass for Hay," but were subsequently stated to have been used for grazing.

## AGRICULTURAL STATISTICS.

TABLE NO. 6.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN EACH COUNTY OF SCOTLAND AS RETURNED ON JUNE 4, 1908.

Countries.	Horses (including Ponies).				CATTLE.				SHEEP.			Pigs.	
	Used solely for agricultural purposes, &c.*	Unbroken Horses.		Total.	Cows and Heifers in Milk.	Cows and Heifers in Calf.†	Other Cattle.		Total.	1 Year Old and above.	Under 1 Year.		Total.
		1 Year and above.	Under 1 Year.				2 Years and above.	Under 2 Years.					
1. Aberdeen . . . . .	23,203	5,841	2,263	31,307	38,028	4,130	42,426	82,670	167,244	141,092	116,157	257,249	13,778
2. Argyll . . . . .	4,532	1,283	480	6,295	12,355	3,692	12,028	24,250	58,255	571,415	293,985	865,410	4,616
3. Argyll . . . . .	7,450	1,690	514	9,654	42,369	9,984	12,745	34,612	99,710	223,404	150,304	373,708	13,986
4. Banff . . . . .	6,767	1,808	737	9,297	11,871	1,266	6,774	24,129	43,540	30,918	29,183	69,998	3,610
5. Berwick . . . . .	4,841	679	132	5,158	2,680	269	5,653	9,383	17,935	171,647	164,696	336,343	3,974
6. Bute . . . . .	967	170	71	1,208	5,078	405	1,285	4,162	9,095	23,983	15,697	39,680	616
7. Caithness . . . . .	4,869	828	272	5,469	6,353	693	2,687	11,174	21,297	78,393	58,270	136,663	1,684
8. Clackmannan . . . . .	1,471	146	65	1,752	1,207	207	2,897	1,150	3,461	3,161	6,486	15,057	1,040
9. Dumfries . . . . .	5,878	1,483	490	7,851	16,628	5,001	12,372	29,017	63,018	340,230	238,078	578,308	9,280
10. Dumfries . . . . .	3,926	566	177	4,669	10,835	761	2,904	4,545	19,145	109,893	80,503	190,396	2,736
11. Edinburgh . . . . .	7,935	760	314	8,969	5,821	698	4,365	12,472	23,266	38,732	25,974	64,696	2,786
12. Elgin . . . . .	2,029	691	276	2,996	10,465	1,754	16,971	16,962	46,112	71,486	59,307	130,793	5,834
13. Forfar . . . . .	8,633	1,276	364	10,273	10,790	968	18,242	17,650	47,890	104,857	57,684	178,989	6,849
14. Fife . . . . .	3,354	567	96	3,917	1,794	231	6,411	3,398	11,834	82,568	57,684	140,252	1,989
15. Inverness . . . . .	7,239	1,508	829	9,576	18,371	3,344	6,402	22,171	50,188	369,075	190,241	559,316	2,550
16. Kinross . . . . .	4,142	735	228	5,105	6,097	513	5,533	11,383	23,528	30,290	24,086	54,376	2,889
17. Kinross . . . . .	820	263	92	1,175	1,237	171	1,097	3,960	6,465	21,868	16,396	38,264	690
18. Kirkcudbright . . . . .	4,146	1,248	319	5,713	14,195	3,440	12,063	21,562	51,260	246,494	163,488	411,982	9,870
19. Lanark . . . . .	6,821	1,598	476	8,895	30,021	9,018	10,949	21,648	71,636	157,338	100,441	257,779	7,226
20. Leithgow . . . . .	1,659	431	148	2,238	3,992	1,051	2,638	8,625	11,306	17,091	8,654	25,745	1,431
21. Linlithgow . . . . .	1,051	275	102	1,428	1,694	250	637	3,338	5,319	12,353	6,217	18,576	627
22. Nairn . . . . .	5,183	939	560	6,682	8,226	1,676	3,325	15,598	28,725	19,147	18,357	37,504	2,383
23. Orkney . . . . .	3,338	1,399	1,228	5,960	6,460	1,460	3,737	5,704	17,361	85,449	48,506	133,955	1,411
24. Orkney . . . . .	912	178	42	1,132	1,674	375	1,507	3,597	7,153	118,511	87,941	206,452	590
25. Peebles . . . . .	10,320	2,387	733	13,440	15,034	2,136	17,995	36,205	70,770	448,776	253,431	702,207	7,548
26. Perth . . . . .	2,598	593	147	3,338	13,241	3,549	9,841	5,385	25,016	26,274	17,426	43,700	1,444
27. Renfrew . . . . .	6,082	1,482	679	8,243	15,258	2,392	7,192	17,897	184,533	105,252	105,252	239,785	4,811
28. Ross and Cromarty . . . . .	3,692	372	112	4,176	4,105	595	4,463	9,009	18,172	296,377	252,649	549,026	3,159
29. Roxburgh . . . . .	582	57	13	652	1,141	142	428	1,609	3,320	104,213	81,961	186,174	447
30. Selkirk . . . . .	950	292	292	1,534	9,234	2,585	7,764	10,979	30,593	80,224	50,682	130,906	1,945
31. Stirling . . . . .	2,153	360	115	2,628	4,308	1,045	1,502	4,702	11,567	137,589	71,776	209,365	764
32. Sutherland . . . . .	4,352	1,357	520	6,229	23,986	1,557	10,317	17,150	53,010	79,413	50,574	129,987	14,048
33. Wigtown . . . . .													
Total . . . . .	155,788	35,345	13,347	204,507	364,684	67,199	247,851	494,671	1,174,405	4,492,482	2,947,013	7,439,495	143,784

\* Including Mares kept for breeding.

† Not separately distinguished before 1907.

TABLE NO. 7.—QUANTITY AND VALUE OF CORN, &c., imported into the United Kingdom in the undermentioned Years.

[From Trade and Navigation Returns.]

	Quantities.			Values.		
	1906.	1907.	1908.	1906.	1907.	1908.
Wheat from—	Cwt.	Cwt.	Cwt.	£	£	£
Russia . . . . .	15,017,500	10,900,800	4,609,710	5,224,904	4,158,072	2,053,788
Germany . . . . .	71,800	19,100	90,000	23,106	5,564	35,288
Turkey . . . . .	242,100	522,600	403,500	81,577	190,783	173,586
Roumania . . . . .	3,780,000	3,256,800	1,837,000	1,276,085	1,147,045	823,216
United States—						
Atlantic Ports . . . . .	17,163,300	17,808,900	18,618,000	6,120,781	7,020,267	7,873,713
Pacific Ports . . . . .	5,327,600	2,888,000	8,505,400	1,919,509	1,069,616	3,576,683
Chile . . . . .	800	85,100	2,210,700	285	86,380	904,588
Argentine Republic . . . . .	19,176,500	21,900,600	31,680,200	6,678,413	8,044,636	13,112,215
British East Indies . . . . .	12,636,200	18,269,600	2,948,900	4,327,631	7,132,317	1,297,138
Australia . . . . .	7,785,100	8,324,200	5,518,200	2,829,720	3,268,021	2,421,286
New Zealand . . . . .	79,400	3,300	29,789	1,067	..	..
Canada . . . . .	11,309,700	12,469,700	14,442,195	4,041,443	4,963,048	5,911,178
Other countries . . . . .	376,300	719,800	268,900	122,942	253,732	113,271
Total . . . . .	92,967,200	97,163,000	91,132,705	32,676,135	37,346,548	38,395,940
Wheat, meal, and flour, from—						
Germany . . . . .	190,600	321,000	309,020	97,856	169,451	167,335
Belgium . . . . .	262,900	177,970	109,500	127,622	86,466	57,641
France . . . . .	560,500	661,700	302,900	249,682	278,402	143,591
Austria-Hungary . . . . .	628,280	423,482	250,304	342,190	275,037	191,498
United States . . . . .	9,809,270	9,324,554	9,781,826	4,744,670	4,741,382	5,369,406
Argentine Republic . . . . .	148,700	49,400	113,110	53,689	16,550	50,635
Australia . . . . .	540,300	131,400	230,300	253,057	68,676	120,780
Canada . . . . .	1,810,500	1,837,920	1,705,532	870,707	921,890	890,700
Other countries . . . . .	239,300	364,880	167,360	77,710	136,728	83,645
Total . . . . .	14,190,300	13,297,366	12,968,855	6,817,213	6,694,082	7,075,231
Barley . . . . .	19,934,500	19,627,620	18,137,200	5,677,587	6,564,670	6,113,945
Oats . . . . .	15,286,500	10,485,290	14,271,150	4,532,160	3,383,553	4,162,775
Peas . . . . .	1,453,420	1,245,670	1,060,999	614,649	602,648	538,315
Beans . . . . .	634,280	799,569	1,048,997	231,758	290,693	373,018
Indian corn or maize . . . . .	48,685,200	53,379,960	33,841,000	11,972,694	14,604,504	10,388,061
Indian corn meal . . . . .	616,250	658,654	450,410	195,302	213,581	159,484
Oatmeal . . . . .	661,809	638,702	500,698	495,980	479,352	416,134
Offals of corn and grain, including rice-meal . . . . .	4,089,146	2,366,508	3,906,576	902,359	637,030	940,928
Rice, exclusive of rice-meal—						
From Brit. East Indies . . . . .	2,891,847	3,205,500	2,656,620	1,225,396	1,553,391	1,210,916
From other countries . . . . .	2,887,207	2,660,475	2,999,316	1,071,252	1,290,013	1,383,980
Other kinds of grain and corn . . . . .	1,626,380	1,476,324	1,472,572	558,247	591,175	613,962
Other kinds of meal and flour . . . . .	120,022	112,634	148,609	51,306	53,416	68,327
Total of corn, &c. . . . .	..	..	..	67,022,088	74,304,656	71,741,011

TABLE NO. 8.—RETURN OF THE AVERAGE PRICES OF WOOL in the Years 1906 and 1907.

Years.	Australian.	South African.	English Fleeces.
	Per lb.	Per lb.	Per lb.
	s. d.	s. d.	s. d.
1906 . . . . .	0 11	0 8½	0 12½ to 0 15½
1907 . . . . .	0 10½	0 8½	0 11 to 0 15

TABLE No. 9.—QUANTITIES AND VALUES OF CORN, MEAT, FOOD PRODUCTS,  
in the Year 1908, with the

[From Trade and

	Quantities.			Values.		
	1906.	1907.	1908.	1906.	1907.	1908.
<b>ANIMALS, LIVING:—</b>	No.	No.	No.	£	£	£
Cattle . . . . .	561,215	472,015	383,130	9,732,180	8,105,109	6,549,285
Sheep and lambs . . . . .	108,359	105,601	78,900	156,947	168,581	122,525
Swine . . . . .	..	..	..	..	..	..
Total value . . . . .	..	..	..	9,889,127	8,273,640	6,671,810
<b>GRAIN, FLOUR, &amp;c.:—</b>	Cwt.	Cwt.	Cwt.	£	£	£
Wheat . . . . .	92,907,200	97,168,000	91,132,705	32,676,185	37,346,548	38,295,940
Wheat meal and flour . . . . .	14,190,300	13,297,866	12,969,855	6,817,213	6,694,082	7,075,231
Barley . . . . .	19,934,500	19,627,620	18,137,200	5,677,587	6,564,670	6,113,945
Oats . . . . .	15,286,500	10,485,200	14,271,150	4,532,160	3,383,553	4,162,775
Peas . . . . .	1,453,420	1,245,670	1,060,999	614,649	602,648	588,315
Beans . . . . .	634,280	799,569	1,043,907	281,758	290,692	373,018
Maize or Indian corn . . . . .	48,685,200	53,879,950	38,841,000	11,972,694	14,604,504	10,388,061
Maize-meal . . . . .	616,250	658,654	450,410	195,302	213,581	159,484
Oatmeal . . . . .	661,809	638,702	500,698	495,980	479,352	416,134
Offals of corn and grain, including rice-meal	4,089,146	2,866,508	3,906,576	902,359	637,030	940,923
Rice, exclusive of rice- meal—						
From British East Indies	2,891,847	3,205,500	2,656,620	1,223,396	1,553,391	1,210,916
From other countries . . . . .	2,387,307	2,660,475	2,999,316	1,071,252	1,290,013	1,383,980
Other kinds of grain & corn	1,626,330	1,476,324	1,472,572	558,247	591,175	613,932
Other kinds of meal and flour	120,022	112,634	145,609	51,306	53,416	68,327
Total value . . . . .	..	..	..	67,022,088	74,304,656	71,741,011
<b>MEAT:—</b>	Cwt.	Cwt.	Cwt.	£	£	£
Beef, salted . . . . .	161,363	188,347	114,742	217,947	201,222	215,320
" fresh . . . . .	5,523,809	5,735,003	5,631,989	9,785,607	10,397,102	10,306,380
Mutton, fresh . . . . .	4,082,756	4,578,523	4,391,269	7,646,985	8,687,407	8,148,457
Bacon . . . . .	5,542,622	5,865,605	5,685,742	14,644,115	14,839,201	14,480,579
Hams . . . . .	1,302,752	1,132,640	1,225,227	3,491,594	3,242,138	3,084,669
Pork, salted (not bacon or hams)	206,056	254,637	270,628	266,800	328,369	328,551
Pork, fresh . . . . .	492,121	567,332	572,322	1,130,950	1,333,342	1,331,485
Meat, unenumerated, fresh	652,363	604,894	697,817	1,145,464	1,041,487	1,188,934
" " salted		58,060	74,018		87,780	107,977
Meat preserved otherwise than by salting	487,424	316,505	464,668	1,322,671	1,534,912	1,883,490
Rabbits (dead) . . . . .	803,556	692,923	550,928	1,000,786	862,735	685,448
Total of dead meat . . . . .	19,254,822	19,444,478	19,679,240	41,151,869	42,560,640	41,763,490
<b>DAIRY PRODUCE:—</b>	Cwt.	Cwt.	Cwt.	£	£	£
Butter . . . . .	4,337,258	4,210,156	4,211,195	23,460,196	22,417,926	24,082,537
Margarine . . . . .	1,101,957	885,068	813,447	2,733,795	2,323,645	2,081,340
Cheese . . . . .	2,638,794	2,372,233	2,306,086	7,607,641	6,905,509	6,684,303
Total . . . . .	8,078,009	7,467,457	7,330,728	33,801,632	31,547,080	32,847,980

AND ARTICLES AFFECTING AGRICULTURE, imported into the United Kingdom  
Corresponding Figures for 1906 and 1907.

*Navigation Returns.]*

	Quantities.			Values.		
	1906.	1907.	1908.	1906.	1907.	1908.
POULTRY (alive or dead). . .	..	..	..	£ 869,114	£ 903,847	£ 934,679
GAME (alive or dead) . . .	..	..	..	116,343	154,086	118,620
Eggs . . . . .	Gt. Hunds. 18,874,059	Gt. Hunds. 18,567,901	Gt. Hunds. 18,210,070	7,098,122	7,135,530	7,183,112
Total value . . . . .	..	..	..	8,083,579	8,193,468	8,236,411
FRUIT, VEGETABLES, &c. :—	Cwt.	Cwt.	Cwt.	£	£	£
Apples . . . . .	2,808,732	3,526,232	3,876,570	1,753,577	2,231,327	2,079,703
Cherries . . . . .	191,106	165,412	160,479	245,906	199,489	235,523
Plums . . . . .	891,113	325,761	402,381	758,720	345,720	428,966
Pears . . . . .	576,573	500,132	523,029	572,274	478,611	515,914
Grapes . . . . .	690,371	798,377	673,678	667,969	769,307	728,026
Oranges . . . . .	5,280,911	6,120,185	5,663,841	2,183,411	2,454,569	2,269,651
Lemons . . . . .	849,935	882,193	1,045,009	440,406	421,599	471,713
Unenumerated . . . . .	504,345	538,465	436,947	385,598	339,462	291,325
Onions . . . . .	Bushels. 8,310,534	Bushels. 8,645,048	Bushels. 7,896,108	953,615	1,036,231	993,664
Potatoes . . . . .	Cwt. 3,819,787	Cwt. 3,249,366	Cwt. 7,038,323	1,332,027	2,371,545	1,970,216
Vegetables, unenumerated } (raw)	..	..	..	404,928	365,230	371,209
Hops . . . . .	232,619	202,324	279,916	852,476	764,631	767,012
Total value . . . . .	..	..	..	10,558,907	11,777,971	11,122,927
OTHER ARTICLES :—	Cwt.	Cwt.	Cwt.	£	£	£
Lard . . . . .	2,049,867	1,965,131	1,987,491	4,361,899	4,491,539	4,407,410
Wool, sheep and lambs' . . .	Lb. 639,342,939	Lb. 759,237,245	Lb. 719,074,887	27,146,133	32,693,011	27,997,328
Wood and timber—						
Hewn (pit-prop or pit- } wood)	2,451,069	2,627,209	3,041,440	2,713,005	3,049,484	3,573,365
Sawn or split, planed or } dressed	6,692,360	5,985,588	5,488,447	18,534,958	17,146,823	14,515,433
Staves . . . . .	139,041	171,721	147,028	632,568	736,422	682,105
Oilseed-cake . . . . .	Tons. 300,196	Tons. 329,784	Tons. 332,482	2,362,471	2,134,724	2,118,518
Seeds—	Cwt.	Cwt.	Cwt.			
Clover and grass . . . .	300,689	338,443	310,826	615,170	683,248	690,320
Cotton . . . . .	Tons. 624,765	Tons. 758,152	Tons. 616,923	3,716,567	4,861,633	4,150,457
Flax or linseed . . . .	Qrs. 1,582,100	Qrs. 2,071,534	Qrs. 2,067,200	3,274,988	4,397,247	4,306,994
Rape . . . . .	118,149	261,960	147,490	234,644	551,157	312,520
Bones (whether burnt or } not)	Tons. 42,604	Tons. 46,115	Tons. 41,412	194,683	206,597	189,840
Guano . . . . .	24,906	81,273	34,417	127,719	148,723	153,899
Cotton, raw . . . . .	Cwt. 17,923,049	Cwt. 21,311,617	Cwt. 18,399,087	55,749,640	70,468,197	55,834,966
Hemp . . . . .	Tons. 117,836	Tons. 134,529	Tons. 118,087	3,712,179	4,239,171	3,671,618
Flax . . . . .	87,334	103,599	95,868	3,557,101	3,942,607	3,416,142
Hides untanned—	Cwt.	Cwt.	Cwt.			
Dry . . . . .	484,318	406,314	357,375	1,602,944	1,484,570	1,215,099
Wet . . . . .	533,678	545,939	681,104	1,493,859	1,610,719	1,387,368
Petroleum . . . . .	Gallons. 299,230,607	Gallons. 304,124,482	Gallons. 343,600,471	5,845,059	6,067,285	6,660,329

TABLE NO. 10.—QUANTITY AND VALUE OF DEAD MEAT imported into the United Kingdom in the undermentioned Years.

	Quantities.			Values.		
	1906.	1907.	1908.	1906.	1907.	1908.
	Cwt.	Cwt.	Cwt.	£	£	£
<b>BACON, from—</b>						
Denmark . . . . .	1,463,880	1,806,984	2,051,148	4,324,055	5,385,275	5,685,526
United States . . . . .	2,775,919	2,280,644	2,541,045	6,859,061	6,042,579	6,035,498
Canada . . . . .	1,190,594	1,192,401	1,004,128	3,185,391	3,171,562	2,518,222
Other countries . . . . .	112,299	85,626	88,523	325,608	259,785	341,838
<b>Total . . . . .</b>	<b>5,542,622</b>	<b>5,365,605</b>	<b>5,685,742</b>	<b>14,644,115</b>	<b>14,889,201</b>	<b>14,480,579</b>
<b>BEEF (salted), from—</b>						
United States . . . . .	146,163	115,410	98,754	197,298	169,700	191,374
Other countries . . . . .	15,200	22,937	15,988	20,709	31,522	25,846
<b>Total . . . . .</b>	<b>161,363</b>	<b>138,347</b>	<b>114,742</b>	<b>217,947</b>	<b>201,222</b>	<b>215,220</b>
<b>BEEF (fresh), from—</b>						
United States . . . . .	2,426,644	2,417,604	1,482,142	5,285,668	5,170,598	3,268,584
Uruguay . . . . .	15,580	65,411	115,958	19,189	89,707	162,723
Argentine Republic . . . . .	2,795,913	2,691,554	3,590,307	4,136,819	4,808,273	6,102,928
Australia . . . . .	36,741	126,080	112,588	64,517	188,745	169,908
New Zealand . . . . .	286,587	391,299	347,872	315,988	566,588	541,000
Other countries . . . . .	12,344	43,105	33,147	23,481	78,301	62,689
<b>Total . . . . .</b>	<b>5,523,809</b>	<b>5,735,008</b>	<b>5,681,989</b>	<b>9,785,607</b>	<b>10,397,102</b>	<b>10,808,380</b>
<b>HAMS, from—</b>						
United States . . . . .	1,045,718	832,042	900,795	2,808,823	2,885,400	2,240,238
Canada . . . . .	254,495	296,949	321,463	674,469	845,021	835,184
Other countries . . . . .	2,589	5,658	2,969	8,302	11,762	9,287
<b>Total . . . . .</b>	<b>1,302,752</b>	<b>1,132,649</b>	<b>1,225,227</b>	<b>3,491,594</b>	<b>3,242,183</b>	<b>3,084,609</b>
<b>*MEAT (unenumerated, salted or fresh), from—</b>						
Netherlands . . . . .	222,280	211,971	248,988	502,027	479,467	558,335
United States . . . . .	189,328	178,797	158,061	282,128	255,209	235,783
Other countries . . . . .	240,755	272,186	369,786	361,309	394,591	502,743
<b>Total . . . . .</b>	<b>652,363</b>	<b>662,954</b>	<b>771,835</b>	<b>1,145,464</b>	<b>1,129,267</b>	<b>1,296,911</b>
<b>MEAT, preserved other- wise than by salting—</b>						
Beef . . . . .	296,301	160,386	270,841	1,103,695	694,468	1,154,337
Mutton . . . . .	48,448	39,220	65,106	125,954	85,548	155,419
Other sorts . . . . .	142,680	116,899	128,721	598,022	554,696	578,724
<b>Total . . . . .</b>	<b>487,424</b>	<b>316,505</b>	<b>464,668</b>	<b>1,822,671</b>	<b>1,534,912</b>	<b>1,888,480</b>
<b>MUTTON (fresh), from—</b>						
Netherlands . . . . .	234,926	221,228	267,222	536,100	528,411	641,135
Uruguay . . . . .	22,393	49,303	63,563	39,776	72,067	100,966
Argentine Republic . . . . .	1,433,097	1,402,302	1,566,746	2,440,996	2,860,565	2,512,656
Australia . . . . .	616,870	888,226	636,034	1,148,460	1,645,470	1,195,259
New Zealand . . . . .	1,748,188	2,005,078	1,737,606	3,417,794	3,996,228	3,452,564
Other countries . . . . .	26,782	42,391	130,088	62,809	84,666	245,857
<b>Total . . . . .</b>	<b>4,082,756</b>	<b>4,578,523</b>	<b>4,391,259</b>	<b>7,645,935</b>	<b>8,687,407</b>	<b>8,148,457</b>
<b>PORK (salted, not Bacon or Hams), from—</b>						
United States . . . . .	67,775	55,919	67,438	116,480	100,724	115,073
Other countries . . . . .	188,281	198,718	203,190	150,820	227,645	213,178
<b>Total . . . . .</b>	<b>206,056</b>	<b>254,637</b>	<b>270,628</b>	<b>266,300</b>	<b>328,369</b>	<b>328,251</b>
<b>PORK (fresh), from—</b>						
Netherlands . . . . .	318,296	429,824	384,004	739,588	1,004,864	912,609
Belgium . . . . .	13,225	18,540	23,123	32,744	45,040	57,602
United States . . . . .	120,784	86,614	185,152	268,804	204,270	290,170
Other countries . . . . .	39,866	33,066	29,943	89,814	84,068	71,054
<b>Total . . . . .</b>	<b>492,121</b>	<b>567,382</b>	<b>572,222</b>	<b>1,180,950</b>	<b>1,338,242</b>	<b>1,331,435</b>
<b>RABBITS (dead), from—</b>						
Belgium . . . . .	66,811	62,385	46,633	185,207	176,718	130,058
Australia . . . . .	644,774	588,866	394,573	684,618	558,339	411,669
New Zealand . . . . .	78,207	75,247	95,450	76,854	78,323	96,808
Other countries . . . . .	18,764	16,925	16,272	54,407	49,355	47,413
<b>Total . . . . .</b>	<b>808,556</b>	<b>692,923</b>	<b>550,228</b>	<b>1,000,786</b>	<b>862,735</b>	<b>685,448</b>
<b>Total of dead meat</b>	<b>19,254,822</b>	<b>19,444,478</b>	<b>19,679,240</b>	<b>41,151,869</b>	<b>42,560,640</b>	<b>41,763,430</b>

\* In the Official Returns for 1908 the imports are shown separately as fresh, 697,817 cwt., value £1,188,984; and salted, 74,018 cwt., value £107,977.

TABLE NO. 11.—QUANTITIES AND VALUES OF BUTTER, MARGARINE, CHEESE, AND EGGS imported into the United Kingdom in each Year from 1906 to 1908 inclusive.

[From Trade and Navigation Returns.]

	Quantities.			Values.		
	1906.	1907.	1908.	1906.	1907.	1908.
<b>BUTTER from—</b>	<b>Cwt.</b>	<b>Cwt.</b>	<b>Cwt.</b>	<b>£</b>	<b>£</b>	<b>£</b>
Russia . . .	606,549	657,049	639,118	2,918,124	3,086,821	3,401,637
Sweden . . .	182,803	226,740	238,929	1,036,638	1,269,820	1,430,769
Denmark . . .	1,675,761	1,818,811	1,857,103	9,636,862	10,192,587	10,984,722
Germany . . .	10,701	7,297	8,195	56,559	34,832	16,751
Netherlands . .	195,366	168,496	244,356	993,396	856,238	1,299,624
France . . .	319,401	281,306	394,612	1,775,601	1,651,137	2,265,494
New S. Wales . .	180,655	195,289	138,953	957,702	974,732	779,293
Queensland . . .	77,982	97,685	67,710	404,980	473,104	369,990
Victoria . . .	287,190	288,670	193,045	1,568,057	1,470,280	1,097,534
New Zealand . .	311,672	313,863	221,395	1,626,997	1,599,226	1,250,211
Canada . . .	190,968	34,753	47,877	976,008	175,537	266,867
United States . .	157,312	1,063	39,914	748,197	5,450	213,832
Other countries .	140,898	118,534	124,988	761,075	628,112	705,813
<b>Total . . .</b>	<b>4,337,258</b>	<b>4,210,156</b>	<b>4,211,195</b>	<b>23,460,196</b>	<b>22,417,926</b>	<b>24,082,537</b>
<b>MARGARINE from—</b>	<b>Cwt.</b>	<b>Cwt.</b>	<b>Cwt.</b>	<b>£</b>	<b>£</b>	<b>£</b>
Norway . . .	5,291	6,099	4,866	12,504	14,385	11,555
Netherlands . .	1,058,618	836,658	764,576	2,601,344	2,085,462	1,945,205
France . . .	29,422	26,505	27,111	102,500	92,684	93,076
Other countries .	8,626	15,806	16,594	17,447	31,114	31,404
<b>Total . . .</b>	<b>1,101,957</b>	<b>885,068</b>	<b>813,447</b>	<b>2,733,795</b>	<b>2,223,645</b>	<b>2,081,240</b>
<b>CHEESE from—</b>	<b>Cwt.</b>	<b>Cwt.</b>	<b>Cwt.</b>	<b>£</b>	<b>£</b>	<b>£</b>
Netherlands . .	229,341	241,551	279,401	545,947	583,579	653,835
France . . .	43,244	47,036	48,597	140,702	152,187	153,371
Australia . . .	...	3,515	757	...	10,833	2,212
New Zealand . .	126,216	192,301	264,995	370,666	586,675	801,131
Canada . . .	1,925,835	1,698,847	1,541,502	5,634,238	4,989,399	4,555,751
United States . .	233,445	114,300	105,555	656,705	337,302	302,662
Other countries .	80,718	74,683	65,279	259,333	245,534	215,241
<b>Total . . .</b>	<b>2,688,794</b>	<b>2,372,233</b>	<b>2,306,086</b>	<b>7,607,641</b>	<b>6,905,509</b>	<b>6,684,203</b>
<b>EGGS from—</b>	<b>Great Hundreds.</b>	<b>Great Hundreds.</b>	<b>Great Hundreds.</b>	<b>£</b>	<b>£</b>	<b>£</b>
Russia . . .	7,182,928	7,178,941	7,061,519	2,344,256	2,392,044	2,518,051
Denmark . . .	3,823,942	3,800,376	3,916,368	1,701,291	1,774,318	1,824,273
Germany . . .	2,644,242	2,621,124	2,370,429	957,905	1,030,190	855,256
Belgium . . .	2,444,746	2,133,612	2,121,760	992,103	891,460	884,686
France . . .	1,491,219	1,232,107	1,225,338	623,104	542,086	535,249
Canada . . .	231,719	115,872	50,354	106,393	53,084	24,786
Other countries .	1,105,233	1,285,869	1,464,302	373,070	452,348	540,811
<b>Total . . .</b>	<b>18,874,059</b>	<b>18,567,901</b>	<b>18,210,070</b>	<b>7,098,122</b>	<b>7,135,530</b>	<b>7,183,112</b>

**EDINBURGH CORN-MARKET GRAIN TABLES for WHEAT, BARLEY, OATS, and BEANS, showing the Quantity offered for Sale, the Quantity Sold, the Highest, Lowest, and Average Prices; also the Bushel-weights of the Highest and Lowest Prices of each kind of Grain for every Market-day, likewise the Results for every Month, and the final Result for the year 1908.**

**WHEAT.**

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for	
						Highest Price.	Lowest Price.
1908						lb. lb.	lb. lb.
Jan.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.		
8	531	444	36 6	24 0	30 7	63	55
15	546	418	38 0	22 6	31 5	63	55
22	628	348	36 0	26 6	32 0	63	58½
29	518	326	37 0	20 9	31 2	63	56
	2,223	1,536	36 10	24 11	31 3		
Feb.							
5	1,111	549	36 6	28 0	32 10	64	59 60
12	952	473	34 0	23 0	28 10	62	56
19	467	170	32 6	17 0	26 10	62½	52½
26	317	210	30 6	25 6	28 7	62	62
	2,847	1,402	34 6	25 4	30 2		
March							
4	612	427	31 0	20 6	27 8	62½	56
11	461	328	31 3	25 3	28 9	61½	56 57
18	395	354	31 0	23 0	27 7	61½	60 60½
25	378	326	29 6	21 0	26 5	63	55
	1,846	1,435	30 9	22 5	27 7		
April							
1	309	302	31 3	21 0	27 10	61½	55
8	188	138	32 6	24 0	29 6	62	57½
15	218	202	33 6	20 0	26 8	63	56
22	319	319	34 0	22 6	29 0	63	57½
29	701	661	34 6	27 6	32 4	62 63	58½
	1,685	1,622	33 11	23 2	29 11		
May							
6	1,210	965	35 0	23 0	30 3	63	55
13	1,308	957	34 6	21 0	29 8	64	56½
20	1,273	813	33 6	23 6	30 2	62	53½
27	1,107	997	34 6	20 0	29 10	63½	55
	4,898	3,732	34 4	21 7	29 10		
June							
8	1,098	349	33 6	21 0	31 1	62½ 63	57½
10	1,557	769	33 6	21 0	28 5	63	58½ 59½
17	2,253	915	31 6	21 0	23 0	63	56½
24	2,446	1,619	31 0	21 0	27 5	63 64½	56
	7,354	3,652	32 0	21 0	28 1		
July							
1	1,354	1,366	30 6	21 6	26 6	63	57
8	1,139	969	30 6	21 0	26 8	62½	56
15	1,061	991	31 0	21 6	27 7	63	58½
22	1,256	1,086	32 6	19 6	29 6	64	55
29	2,374	2,590	32 6	28 3	29 6	63	58½
	8,184	7,002	32 1	21 2	28 3		

## WHEAT—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1908							
Aug.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.	lb. lb.
5	1,875	1,568	32 0	25 0	30 3	63	60
12	2,556	971	32 0	23 9	28 9	63	60
19	2,805	1,550	31 0	23 0	28 0	63	59½
26	2,001	1,093	30 0	24 3	27 5	63	60½
	9,237	5,182	31 3	24 4	28 9		
Sept.							
2	1,328	898	32 0	23 0	27 8	63	55
9	1,087	967	32 6	23 9	28 4	63	58
16	505	505	30 6	21 0	28 7	62	56
23	430	260	32 6	25 3	29 5	63	60½
30	234	199	35 0	20 0	26 1	63	55
	3,484	2,769	32 0	23 11	28 1		
Oct.							
7	82	42	35 0	23 0	26 2	62	56
14	401	166	37 0	25 6	32 9	63	59
21	583	306	38 0	25 6	32 1	63	59
28	590	304	36 6	25 0	32 6	63	58½
	1,662	818	36 9	25 0	32 1		
Nov.							
4	1,044	605	38 0	27 0	31 5	63½	60
11	1,046	577	36 6	26 6	31 5	63	58½
18	571	313	35 6	29 6	32 4	64	58
25	514	318	35 0	26 6	30 9	62	58½
	3,175	1,813	36 3	27 4	31 6		
Dec.							
2	355	305	33 0	26 6	30 2	61½	60
9	359	150	34 9	27 6	32 2	63	59
16	709	534	34 9	24 6	30 11	63	61½
23	501	371	34 9	24 9	33 0	62½	58½
30	579	479	35 9	26 0	34 1	63	60
	2,503	1,839	34 6	25 11	32 2		
Result for year }	49,093	32,802	33 2	23 4	29 3		

## BARLEY.

1908							
Jan.							
8	1,457	855	34 0	18 0	27 2	56	55
15	1,593	1,236	32 0	21 0	28 6	55½	52½
22	1,714	1,152	33 6	22 9	28 2	56	51½
29	1,412	634	32 6	24 0	28 8	55	48
	6,131	3,877	32 9	21 3	28 2		
Feb.							
5	1,344	834	31 6	21 3	28 1	55	50½
12	1,462	955	32 6	20 0	27 11	56½	50½
19	1,125	471	32 6	24 0	27 10	56	50
26	1,402	326	29 6	23 9	27 6	56	54
	5,323	2,586	31 4	22 2	27 11		

## BARLEY—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for			
						Highest Price.		Lowest Price.	
1908	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.		lb. lb.	
March									
4	1,688	698	29 8	20 0	27 2	55		51	
11	1,548	1,040	31 8	20 0	27 1	55½		53	
18	518	311	30 0	21 6	25 8	56		52	
25	1,543	579	30 6	17 6	25 5	55		48	
	5,392	2,523	30 1	20 0	26 7				
April									
1	1,321	198	29 6	23 0	25 9	55		51½	54
8	1,395	517	30 0	21 6	26 2	56		55	
15	581	299	29 0	24 0	26 4	56		56	
22	928	391	28 6	19 9	25 10	56		50	
29	516	421	28 6	22 0	25 10	55		54½	
	4,541	1,826	29 0	22 4	26 0				
May									
6	1,011	631	28 0	23 0	25 9	56		54	
13	448	391	27 0	20 0	25 8	56		50½	
20	271	146	27 6	22 0	24 7	56		50½	
27	121	51	24 6	24 0	24 1	51½		51½	52
	1,846	1,219	27 2	22 9	25 6				
June									
3	241	130	27 0	24 9	25 10	55		51½	
10	141	45	23 0	..	23 0	54		..	
17	255	79	27 0	25 3	25 9	55		54	
24	290	80	23 0	..	23 0	53½		..	
	927	284	24 9	25 0	25 1				
July									
1	284	70	21 0	..	21 0	54		..	
8	105	10	22 6	..	22 6	50½		..	
15	25	25	25 0	..	25 0	55		..	
22	89	30	21 8	..	21 8	54		..	
29	50	50	24 6	..	24 6	55		..	
	553	185	22 7	..	22 7				
Aug.									
5	120	90	22 6	..	22 6	54		..	
12	..	..	..	..	..	..		..	
19	110	50	22 6	..	22 6	52½		..	
26	145	125	31 0	22 0	27 2	56		54	
	375	265	25 4	22 0	24 8				
Sept.									
2	905	738	31 0	26 0	28 8	56		54	
9	635	555	30 0	27 3	29 2	54	55	54½	
16	1,956	1,555	31 0	30 0	28 11	55	56	44	
23	2,406	1,952	31 0	23 6	27 9	56		56	
30	1,510	1,279	31 0	22 6	27 10	55	56	53	
	7,412	6,079	30 8	24 6	28 4				
Oct.									
7	2,368	1,938	31 6	21 6	26 11	55		49	53½
14	2,364	1,716	32 0	22 8	27 6	56		53½	
21	2,066	1,187	31 0	28 6	27 1	56		54	
28	1,815	635	31 0	21 6	27 2	55	56	53	
	8,113	5,676	31 8	22 8	27 2				

## BARLEY—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1908	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.	lb. lb.
Nov.							
4	1,882	1,228	31 6	18 6	28 5	55½ 56	51½
11	1,664	1,137	32 0	21 0	28 3	56	53½
18	1,640	1,396	32 0	21 0	28 11	56	51½
25	2,002	1,020	31 6	24 0	28 9	55 56	51½
	6,688	4,766	31 8	20 11	28 7		
Dec.							
2	2,803	1,626	32 0	24 0	28 8	56½	53
9	2,321	1,701	32 0	23 0	28 10	56	53
16	2,329	1,490	32 0	24 0	28 10	56	54 56
23	1,502	357	32 0	23 0	29 2	56	54
30	1,122	820	31 3	25 0	26 9	56	54
	9,877	5,994	31 11	24 6	28 6		
Result for year	56,978	35,285	29 10	23 0	27 9		

## OATS.

1908							
Jan.							
8	2,058	1,206	26 6	12 0	19 6	44½	37½
15	2,545	1,283	27 0	14 9	20 4	44½	39
22	3,823	1,864	27 0	15 3	19 2	44½	40 41
29	2,913	1,245	28 0	14 6	20 1	44½	38 39½
	11,439	5,098	27 2	14 9	19 9		
Feb.							
5	2,316	1,355	28 6	15 0	20 5	44½	40
12	2,842	1,590	30 0	13 9	20 9	46	41
19	3,173	1,806	30 0	11 3	19 7	46½	40
26	2,854	1,219	30 0	14 6	21 2	46½	42
	11,185	5,970	29 8	13 11	20 5		
March							
4	2,493	1,214	30 0	14 6	21 11	44½	39½
11	3,235	1,578	29 6	16 0	21 9	44½	41 42
18	3,397	1,657	29 0	16 0	22 1	44½ 45	40
25	2,909	948	29 2	16 9	24 3	44½ 45	39
	12,024	5,397	29 3	15 10	22 4		
April							
1	2,703	1,132	29 0	15 9	22 9	44½ 45	40
8	2,641	1,363	28 6	15 0	22 3	44½	41
15	1,871	816	27 0	16 0	21 0	44	42
22	1,838	714	28 6	17 0	21 4	44½	42
29	1,597	770	26 6	15 6	21 1	42½ 43½	41
	10,150	4,795	27 11	15 6	21 10		
May							
6	2,237	1,419	28 0	16 9	21 7	44	40
13	2,390	1,540	27 6	17 6	21 11	44	41 42
20	1,265	600	28 9	18 0	23 2	44½	42 43
27	1,496	568	27 0	18 3	21 10	44½	41½
	7,338	4,127	27 10	17 7	21 11		

## OATS—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for			
						Highest Price.		Lowest Price.	
1908	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb.	lb.	lb.	lb.
June									
8	1,947	935	28 0	17 6	21 11	44½		42	
10	2,455	628	27 9	16 0	22 10	44½		40	
17	2,310	809	28 0	18 9	23 2	44½		42	
24	2,261	1,060	26 0	16 0	22 7	44½		42	
	8,973	3,452	27 0	17 9	22 7				
July									
1	2,382	827	25 6	16 3	20 9	44½		42	
8	2,167	587	26 0	16 6	19 1	44½		40	
15	2,094	626	25 0	17 0	19 4	44½		40	
22	1,288	551	25 6	17 6	21 3	44½		42½	
29	1,557	813	26 0	18 0	22 5	44½		41	
	9,398	3,354	25 6	16 7	21 0				
Aug.									
5	1,639	863	25 0	18 0	21 10	44½		42	
12	1,872	820	24 6	17 6	20 11	44½		42	
19	1,856	687	24 6	18 0	20 5	44½		42	
26	2,006	1,009	26 0	18 0	21 6	48½		42	43½
	7,373	3,379	24 9	17 10	21 3				
Sept.									
2	2 058	1,394	24 0	18 6	22 3	44½		42	
9	1,706	1,019	24 6	18 3	21 11	44½		42	
16	1,908	1,547	23 6	17 9	21 7	44½		42	
23	1,288	947	23 0	18 0	21 2	42 44½		42	
30	1,464	1,129	23 9	19 0	21 6	44½		41	43½
	3,423	5,976	23 6	18 7	21 8				
Oct.									
7	2,355	1,158	24 0	15 6	20 7	44		40	
14	2,225	1,205	22 9	17 0	19 5	44½		41	42
21	1,667	1,031	22 9	18 0	19 9	44½		42	
28	1,591	1,132	23 0	17 6	20 3	44½		42	
	7,838	4,526	23 2	17 10	20 0				
Nov.									
4	1,404	867	23 0	17 6	20 8	44 44½		41	42
11	2,119	1,242	23 6	17 0	20 5	44½		42	
18	2,769	1,277	23 6	18 0	19 9	44½		41	42
25	3,182	1,521	23 0	17 0	20 7	45		40	
	9,474	4,907	23 1	17 7	20 4				
Dec.									
2	3,332	1,641	22 6	18 0	20 0	44½		42	
9	3,430	1,941	23 0	17 0	20 1	44½		40½	
16	3,109	1,558	23 8	16 6	19 9	44½		41	
23	2,455	934	23 0	16 0	19 5	45		42	
30	1,715	1,055	21 9	17 0	19 0	44½		42	
	18,981	7,114	22 7	17 7	19 9				
Result for year	117,546	58,095	25 6	17 0	21 0				

## BEANS.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1908						lb. lb.	lb. lb.
Jan.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.		
8	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..
22	..	..	..	..	..	..	..
29	4	4	34 0	..	34 0	60½	..
	4	4	34 0	..	34 0		
Feb.							
5	130	40	32 9	..	32 9	61	..
12	60	20	34 9	..	34 9	63	..
19	72	12	29 6	..	29 6	60	..
26	199	89	34 0	33 0	33 3	62	62
	451	161	32 11	33 0	33 1		
March							
4	227	80	33 0	32 3	32 6	63	63
11	286	40	29 0	..	29 0	63	..
18	101	..	..	..	..	..	..
25	85	6	31 0	..	31 0	63	..
	699	126	30 5	32 3	31 4		
April							
1	87	30	31 0	27 0	29 0	63	63
8	104	18	30 6	..	30 6	63	..
15	78	37	28 6	..	28 6	62	..
22	25	21	34 0	..	34 0	65	..
	296	106	30 7	27 0	30 1		
May							
6	..	..	..	..	..	..	..
13	..	..	..	..	..	..	..
20	..	..	..	..	..	..	..
27	..	..	..	..	..	..	..
	..	..	..	..	..	..	..
June							
8	..	..	..	..	..	..	..
10	..	..	..	..	..	..	..
17	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..
	..	..	..	..	..	..	..
July							
1	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..
22	20	10	33 0	..	33 0	63	..
29	..	..	..	..	..	..	..
	20	10	33 0	..	33 0		
Aug.							
5	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..
	..	..	..	..	..	..	..

## BEANS—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1908							
Sept.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.	lb. lb.
2	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..
	..	..	..	..	..		
Oct.							
7	..	..	..	..	..	..	..
14	14	..	..	..	..	..	..
21	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..
	14	..	..	..	..		
Nov.							
4	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..
18	..	..	..	..	..	..	..
25	..	..	..	..	..	..	..
	..	..	..	..	..		
Dec.							
2	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..
16	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..
30	..	..	..	..	..	..	..
	..	..	..	..	..		
Result for year }	1,484	407	31 5	31 10	31 9		

# PRICES OF SHEEP SINCE 1818.

TABLE No. 1.—CHEVIOT SHEEP.

Year.	Wethers.		Ewes.		Lambs.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1818	28 0	to 30 0	not quoted.		8 0	to 10 0
1819	25 0	" 27 0	15 0	to 17 0	10 6	" 12 0
1820	30 0	" 25 0	16 0	" 17 0	10 0	" 11 0
1821	18 0	" 20 0	14 0	" 16 0	7 6	" 8 0
1822	12 6	" 18 0	8 0	" 8 6	4 6	" 0 0
1823	18 6	" 18 0	7 0	" 10 6	5 6	" 6 0
1824	14 0	" 19 0	7 0	" 9 0	4 6	" 6 0
1825	29 0	" 32 0	15 0	" 19 0	9 0	" 10 6
1826	17 6	" 21 6	18 0	" 15 0	7 0	" 7 6
1827	15 0	" 24 0	not quoted.		7 0	" 8 0
1828	18 0	" 27 6	12 0	to 15 0	7 0	" 8 8
1829	18 0	" 24 0	12 6	" 14 0	7 0	" 8 6
1830	15 0	" 21 0	8 0	" 11 0	6 0	" 6 9
1831	18 0	" 25 0	9 0	" 13 0	7 0	" 8 0
1832	19 0	" 24 0	11 0	" 16 0	7 0	" 9 0
1833	22 0	" 31 0	13 6	" 20 0	8 0	" 11 8
1834	22 0	" 31 0	13 6	" 21 0	9 0	" 11 6
1835	22 0	" 27 6	18 0	" 30 6	8 0	" 11 0
1836	24 0	" 31 6	16 0	" 19 0	10 0	" 14 0
1837	19 0	" 28 0	14 0	" 19 0	10 0	" 13 0
1838	23 0	" 30 6	17 0	" 22 0	12 0	" 14 0
1839	23 0	" 31 0	14 0	" 19 0	0 0	" 13 0
1840	24 0	" 33 0	15 0	" 23 0	7 0	" 11 6
1841	23 0	" 30 0	14 0	" 22 0	8 0	" 12 0
1842	22 6	" 28 0	13 0	" 17 0	7 6	" 10 0
1843	19 0	" 25 0	8 0	" 12 0	5 0	" 8 0
1844	21 0	" 29 0	10 0	" 16 0	8 0	" 10 6
1845	23 0	" 33 0	13 0	" 20 0	8 0	" 13 0
1846	24 0	" 33 6	14 6	" 21 6	10 0	" 14 6
1847	24 0	" 35 0	13 0	" 24 0	11 6	" 15 0
1848	23 0	" 34 6	13 0	" 28 0	11 6	" 15 0
1849	21 0	" 30 2	12 0	" 21 0	0 0	" 14 0
1850	20 6	" 29 6	12 0	" 20 0	8 0	" 13 0
1851	21 6	" 31 0	13 0	" 21 0	8 9	" 14 0
1852	21 0	" 32 0	15 0	" 23 0	8 0	" 14 0
1853	26 6	" 38 0	17 0	" 28 6	9 0	" 17 0
1854	25 0	" 36 0	17 0	" 26 0	9 0	" 16 6
1855	23 6	" 36 0	16 0	" 25 0	10 0	" 17 0
1856	22 0	" 35 6	15 6	" 24 0	10 0	" 15 0
1857	24 0	" 36 0	14 6	" 26 0	10 6	" 14 6
1858	24 0	" 34 6	14 0	" 24 6	10 6	" 14 0
1859	25 0	" 34 6	16 0	" 25 0	10 8	" 14 9
1860	26 0	" 38 0	17 6	" 27 6	12 6	" 17 6
1861	25 0	" 38 6	16 0	" 28 0	9 0	" 16 0
1862	27 0	" 37 6	17 6	" 28 0	10 0	" 16 0
1863	25 0	" 38 6	19 0	" 28 6	10 6	" 16 0
1864	31 0	" 41 0	21 0	" 31 6	14 0	" 18 0
1865	32 6	" 44 0	22 6	" 33 6	14 6	" 20 0
1866	37 0	" 50 0	29 0	" 42 6	15 0	" 26 0
1867	26 0	" 58 0	18 0	" 25 6	12 0	" 16 0
1868	30 0	" 32 0	15 6	" 21 0	7 6	" 13 0
1869	28 0	" 38 0	15 0	" 22 6	7 6	" 14 0
1870	35 6	" 43 0	18 0	" 23 0	10 0	" 17 0
1871	36 6	" 49 0	22 0	" 33 6	14 0	" 20 0
1872	45 0	" 56 0	32 0	" 42 0	16 0	" 22 0
1873	42 0	" 51 0	25 0	" 42 0	15 6	" 22 0
1874	33 6	" 44 6	21 0	" 36 0	12 0	" 17 0
1875	33 0	" 43 6	21 0	" 34 0	13 6	" 23 6
1876	40 0	" 52 6	23 0	" 30 0	13 6	" 25 0
1877	41 0	" 51 0	25 0	" 37 0	15 0	" 24 0
1878	36 6	" 48 0	23 6	" 35 0	14 0	" 22 0
1879	34 0	" 44 0	21 0	" 34 0	14 0	" 20 0
1880	30 0	" 43 6	20 0	" 30 0	12 6	" 20 0
1881	32 0	" 45 6	29 0	" 34 0	14 0	" 20 0
1882	40 0	" 51 0	30 0	" 40 0	14 0	" 20 6
1883	44 0	" 55 6	34 6	" 46 6	15 6	" 23 0
1884	36 0	" 47 6	29 6	" 41 6	12 6	" 20 0
1885	30 0	" 38 0	24 0	" 31 0	12 0	" 18 0
1886	32 0	" 40 0	31 0	" 29 0	12 6	" 19 0

TABLE NO. 1.—CHEVIOT SHEEP—Continued.

Year.	Wethers.				Ewes.				Lambs.						
	s.	d.		s.	d.	s.	d.		s.	d.		s.	d.		
1887	29	0	to	36	0	18	0	to	26	0	11	0	to	16	6
1888	30	0	"	38	0	19	0	"	27	0	12	0	"	17	6
1889	36	0	"	44	0	24	0	"	32	0	14	0	"	22	0
1890	31	0	"	40	0	22	0	"	30	0	12	6	"	20	0
1891	27	0	"	38	0	16	0	"	25	0	9	0	"	16	0
1892	22	0	"	30	6	13	0	"	22	0	5	0	"	11	0
1893	26	0	"	35	6	18	0	"	28	6	8	6	"	15	0
1894	26	0	"	37	0	20	0	"	31	0	10	6	"	18	6
1895	28	0	"	39	0	22	0	"	34	0	11	6	"	19	6
1896	24	6	"	34	0	19	0	"	30	6	9	0	"	16	6
1897	27	0	"	36	0	21	0	"	31	6	11	0	"	17	6
1898	27	0	"	37	0	22	0	"	32	6	12	0	"	18	6
1899	24	0	"	33	0	20	0	"	30	6	10	6	"	16	0
1900	26	0	"	36	0	22	0	"	32	6	12	0	"	17	0
1901	25	0	"	32	6	20	0	"	29	6	11	0	"	16	0
1902	24	0	"	31	6	18	0	"	27	0	9	6	"	14	6
1903	26	0	"	34	0	21	0	"	31	0	11	4	"	18	0
1904	28	6	"	36	6	23	0	"	32	6	13	0	"	20	0
1905	27	6	"	35	0	23	0	"	33	0	14	0	"	21	0
1906	30	0	"	38	0	26	0	"	34	6	15	0	"	23	0
1907	28	0	"	34	0	22	0	"	30	6	13	6	"	19	6
1908	26	0	"	32	6	21	0	"	27	6	11	6	"	17	0

TABLE NO. 2.—BLACKFACE SHEEP.

Year.	Wethers.				Ewes.				Lambs.						
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.			
1819	22	0	to	24	0	12	0	to	15	0	8	0	to	9	0
1820	20	0	"	23	8	15	6	"	17	0	7	0	"	8	6
1821	18	0	"	20	0	12	0	"	13	0	6	0	"	7	0
1822	11	6	"	13	6	5	6	"	6	0	4	6	"	0	0
1823	12	0	"	16	0	5	0	"	6	6	4	0	"	5	8
1824	9	6	"	13	6	6	0	"	7	0	4	0	"	5	0
1825	22	0	"	26	0	11	0	"	18	6	6	0	"	9	0
1826	15	0	"	17	0	8	0	"	9	0	4	6	"	6	0
1827	14	0	"	18	6	7	0	"	10	0	6	0	"	7	6
1828	15	0	"	20	0	8	0	"	11	0	5	0	"	7	6
1829	14	0	"	18	0	9	0	"	10	0	6	0	"	7	0
1830	9	6	"	13	0	4	0	"	6	0	4	6	"	6	0
1831	13	0	"	17	0	5	0	"	7	6	5	0	"	6	6
1832	14	0	"	18	0	7	0	"	11	6	6	0	"	7	8
1833	16	0	"	24	0	7	6	"	12	0	6	6	"	9	0
1834	16	0	"	22	0	10	0	"	13	0	6	0	"	8	6
1835	15	0	"	18	9	10	0	"	13	0	7	0	"	8	0
1836	15	0	"	21	0	9	0	"	12	0	8	6	"	11	0
1837	13	0	"	16	0	8	0	"	12	0	8	0	"	9	6
1838	15	0	"	20	6	10	0	"	13	0	not quoted.				
1839	15	0	"	22	0	10	0	"	12	0	7	0	to	8	3
1840	16	0	"	22	6	11	0	"	12	0	7	0	"	9	3
1841	16	0	"	20	0	9	0	"	11	0	6	0	"	8	0
1842	14	0	"	19	0	7	6	"	8	0	5	6	"	7	0
1843	not quoted.				4	9	"	6	6	not quoted.					
1844	15	0	to	21	0	6	6	"	10	0	5	0	to	8	0
1845	14	0	"	23	0	8	0	"	12	0	6	0	"	8	0
1846	13	0	"	24	0	10	0	"	13	0	8	0	"	9	0
1847	20	6	"	25	0	10	0	"	14	0	8	6	"	9	6
1848	20	0	"	24	0	11	3	"	12	0	8	6	"	10	0
1849	not quoted.				not quoted.				7	0	"	7	6		
1850									7	0	"	0	0		
1851	17	6	to	23	0	9	0	to	12	0	6	6	"	8	0
1852	18	6	"	22	0	9	6	"	12	0	4	6	"	7	9
1853	23	0	"	27	0	14	6	"	16	6	8	0	"	11	6
1854	20	0	"	26	0	11	0	"	16	6	8	0	"	10	6
1855	23	6	"	26	6	14	0	"	16	0	10	0	"	11	0
1856	17	0	"	24	0	10	0	"	20	0	7	6	"	10	0
1857	20	0	"	29	0	10	6	"	15	0	9	3	"	11	0
1858	20	0	"	27	6	9	9	"	18	9	8	3	"	10	6
1859	20	0	"	25	0	10	0	"	14	0	8	9	"	11	0
1860	21	0	"	27	3	11	0	"	16	0	10	0	"	13	6
1861	21	0	"	29	0	12	0	"	22	0	6	3	"	14	0
1862	16	9	"	27	0	12	0	"	18	8	6	0	"	12	0

TABLE NO. 2.—BLACKFACE SHEEP—*Continued.*

Year.	Wethers.				Ewes.				Lambs.			
	s.	d.		s. d.	s.	d.		s. d.	s.	d.		s. d.
1863	30	0	to	30 6	13	0	to	16 0	8	0	to	11 6
1864	25	0	"	30 0	15	0	"	19 0	10	0	"	13 6
1865	15	6	"	32 6	15	0	"	25 0	10	0	"	17 0
1866	31	6	"	40 0	20	0	"	36 0	13	6	"	22 6
1867	20	0	"	30 6	14	0	"	22 0	7	6	"	13 6
1868	20	0	"	35 0	10	6	"	13 6	7	0	"	13 0
1869	22	0	"	28 0	11	0	"	14 0	6	9	"	9 0
1870	27	0	"	32 6	13	0	"	22 0	8	0	"	14 6
1871	23	0	"	37 0	13	0	"	23 0	11	0	"	16 3
1872	31	6	"	45 0	18	0	"	32 0	12	6	"	18 0
1873	28	0	"	39 0	16	6	"	27 0	7	0	"	16 0
1874	25	0	"	35 0	13	0	"	20 0	7	0	"	14 0
1875	26	6	"	37 6	15	0	"	21 3	9	6	"	17 6
1876	30	0	"	40 0	19	0	"	24 0	13	0	"	20 6
1877	35	0	"	38 9	18	0	"	25 0	13	6	"	23 0
1878	30	0	"	36 0	17	0	"	23 0	12	0	"	22 0
1879	25	0	"	35 9	16	0	"	24 0	10	6	"	20 0
1880	25	0	"	38 0	16	6	"	22 6	10	0	"	17 0
1881	30	0	"	39 0	15	0	"	23 0	10	0	"	15 0
1882	33	0	"	46 0	20	0	"	28 0	12	6	"	18 6
1883	36	0	"	50 6	24	6	"	33 0	14	0	"	21 6
1884	29	0	"	43 6	19	6	"	28 0	12	0	"	19 6
1885	24	0	"	34 0	13	0	"	22 6	10	0	"	15 0
1886	25	0	"	34 0	12	0	"	22 0	10	6	"	16 0
1887	23	0	"	30 0	11	0	"	19 0	8	0	"	13 0
1888	22	0	"	32 0	13	0	"	24 0	10	0	"	15 0
1889	26	0	"	40 0	18	0	"	29 0	13	0	"	22 0
1890	24	0	"	37 0	14	0	"	27 0	10	6	"	19 0
1891	21	0	"	37 0	10	0	"	24 0	7	6	"	15 0
1892	16	0	"	28 6	6	0	"	17 0	3	0	"	10 0
1893	21	0	"	37 0	12	0	"	24 0	7	0	"	14 6
1894	20	0	"	37 6	14	6	"	26 6	8	6	"	16 0
1895	23	0	"	41 0	16	0	"	28 6	9	0	"	17 0
1896	19	0	"	35 4	13	0	"	24 0	6	0	"	13 6
1897	21	0	"	36 6	15	0	"	25 6	7	0	"	14 6
1898	22	0	"	37 0	16	0	"	26 6	8	0	"	15 0
1899	20	0	"	33 6	13	0	"	24 0	5	6	"	13 0
1900	23	0	"	36 0	16	0	"	26 6	8	0	"	15 6
1901	20	0	"	35 0	14	0	"	25 6	6	6	"	14 6
1902	18	6	"	34 0	12	0	"	24 0	6	0	"	14 0
1903	21	0	"	36 0	15	0	"	28 0	7	0	"	16 6
1904	23	0	"	38 6	18	0	"	30 0	8	6	"	17 6
1905	21	6	"	37 0	19	0	"	31 0	9	0	"	18 6
1906	23	0	"	38 0	20	0	"	33 0	10	0	"	19 6
1907	21	0	"	33 6	17	0	"	28 0	8	6	"	17 6
1908	19	6	"	30 0	15	0	"	24 6	8	0	"	16 0

TABLE NO. 3.—PRICE OF WOOL, PER STONE OF 24 LB., SINCE 1818.

Year.	Laid Cheviot.			White Cheviot.		Laid Highland.			White Highland.	
	s.	d.		s.	d.	s.	d.		s.	d.
1818	40	0	to	42	2	20	0	to	22	6
1819	21	0	"	23	0	10	0	"	10	3
1820	20	0	"	22	0	9	0	"	10	0
1821	18	0	"	20	0	9	0	"	10	6
1822	12	6	"	14	6	5	0	"	6	6
1823	9	0	"	10	6	5	0	"	5	9
1824	13	6	"	15	0	6	0	"	6	3
1825	10	6	"	22	0	10	0	"	10	6
1826	11	0	"	14	0	5	0	"	5	6
1827	11	0	"	14	0	5	6	"	6	9
1828	8	0	"	11	0	5	6	"	6	0
1829	8	6	"	11	0	4	3	"	0	0
1830	9	6	"	11	0	4	6	"	5	0
1831	17	0	"	20	0	7	6	"	8	6
1832	14	0	"	16	0	7	0	"	7	6
1833	18	0	"	20	7	10	0	"	11	0
1834	21	0	"	24	6	5	6	"	7	0
1835	19	0	"	20	6	9	6	"	10	8
1836	21	0	"	25	0	10	0	"	14	0
1837	12	0	"	14	0	7	0	"	7	8

TABLE NO. 3.—PRICE OF WOOL—Continued.

Year.	Laid Cheviot.		White Cheviot.		Laid Highland.		White Highland.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1888	19 0	to 22 6	..	..	6 0	to 10 0	..	..
1889	18 0	" 20 0	..	..	8 0	" 12 0	..	..
1890	15 0	" 0 0	..	..	7 0	" 0 0	..	..
1891	15 0	" 16 9	..	..	6 0	" 7 5	..	..
1892	12 6	" 14 0	..	..	not quoted.		..	..
1893	9 0	" 11 6	..	..	5 0	to 6 0	..	..
1894	15 0	" 18 0	..	..	not quoted.		..	..
1895	14 6	" 17 6	..	..	7 6	to 8 6	..	..
1896	12 0	" 14 6	..	..	8 0	" 8 6	..	..
1897	12 6	" 14 0	..	..	not quoted.		..	..
1898	9 6	" 11 0	..	..	4 9	to 0 0	..	..
1899	12 0	" 16 6	..	..	6 0	" 6 8	..	..
1900	15 0	" 17 6	..	..	8 0	" 8 6	..	..
1901	12 0	" 16 0	..	..	8 0	" 9 8	..	..
1902	18 0	" 15 0	..	..	8 0	" 9 0	..	..
1903	19 0	" 22 0	..	..	11 0	" 12 6	..	..
1904	12 0	" 15 0	..	..	7 6	" 8 6	..	..
1905	14 6	" 19 0	..	..	8 6	" 9 0	..	..
1906	19 0	" 21 6	..	..	11 0	" 0 0	..	..
1907	19 0	" 24 0	..	..	12 0	" 14 8	..	..
1908	15 0	" 17 0	..	..	8 9	" 10 0	..	..
1909	18 6	" 24 0	..	..	10 9	" 11 6	..	..
1910	22 0	" 32 0	27 0	to 38 0	10 0	" 11 8	..	..
1911	19 6	" 27 0	from 30s. upwards.		not quoted.		..	..
1912	18 6	" 26 0	30 0	to 37 0	11 6	to 16 0	..	..
1913	25 6	" 31 0	38 0	" 42 0	15 8	" 17 6	..	..
1914	31 0	" 39 0	47 0	" 54 0	17 6	" 20 0	..	..
1915	23 0	" 30 0	44 0	" 45 0	15 0	" 17 0	..	..
1916	24 0	" 30 0	50 0	" 58 0	14 0	" 16 0	..	..
1917	16 0	" 21 6	not quoted.		not quoted.		..	..
1918	19 0	" 26 0	28 0	to 32 0	8 6	to 9 0	..	..
1919	18 0	" 26 6	not quoted.		8 6	" 10 0	..	..
1920	15 0	" 23 6	25 0	to 26 0	9 6	" 0 0	..	..
1921	20 0	" 26 6	30 0	" 34 6	12 0	" 15 0	..	..
1922	26 0	" 37 6	40 0	" 48 0	18 0	" 21 0	..	..
1923	17 0	" 18 0	34 0	" 40 0	9 0	" 12 0	..	..
1924	18 6	" 26 6	30 0	" 34 0	9 6	" 13 0	..	..
1925	25 0	" 32 0	34 6	" 36 0	12 6	" 16 0	..	..
1926	20 0	" 24 0	30 0	" 34 6	9 6	" 12 0	..	..
1927	20 9	" 26 0	28 0	" 30 0	10 0	" 12 0	..	..
1928	18 9	" 25 0	27 0	" 32 0	8 6	" 11 6	..	..
1929	15 0	" 17 0	prices very low.		7 0	" 0 0	..	..
1930	20 0	" 24 0	30 0	to 32 0	10 6	" 11 6	14 0	to 15 0
1931	17 0	" 21 0	27 0	" 30 0	5 0	" 9 6	12 0	" 13 0
1932	14 0	" 18 0	27 6	" 28 0	7 6	" 9 0	18 0	" 14 0
1933	13 0	" 18 0	26 0	" 28 0	6 6	" 8 6	11 6	" 12 6
1934	13 0	" 18 0	26 0	" 28 0	6 6	" 8 6	11 6	" 12 6
1935	12 0	" 17 0	22 6	" 26 0	6 0	" 8 0	11 6	" 12 0
1936	18 0	" 18 0	23 0	" 27 6	6 6	" 8 6	11 6	" 12 0
1937	14 0	" 22 0	23 0	" 28 0	7 0	" 9 0	11 6	" 18 0
1938	13 0	" 20 0	23 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1939	13 0	" 18 0	24 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1940	18 0	" 18 0	24 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1941	12 6	" 18 0	22 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1942	12 0	" 18 0	20 0	" 28 0	7 0	" 8 6	10 6	" 12 0
1943	12 0	" 17 0	20 0	" 27 0	7 0	" 8 0	10 0	" 12 0
1944	12 0	" 16 0	20 0	" 26 0	7 0	" 8 0	10 0	" 12 0
1945	12 0	" 16 0	20 0	" 25 0	7 0	" 8 0	10 0	" 11 6
1946	11 0	" 15 0	19 0	" 24 0	7 0	" 8 0	10 0	" 11 6
1947	11 0	" 14 0	18 6	" 23 0	7 0	" 8 0	10 6	" 12 0
1948	10 0	" 13 0	16 0	" 20 0	7 0	" 8 0	10 0	" 11 6
1949	10 0	" 12 0	18 0	" 18 6	7 0	" 8 0	8 6	" 9 6
1950	9 9	" 12 0	18 0	" 18 6	6 9	" 7 9	8 0	" 9 6
1951	9 0	" 10 0	11 0	" 16 6	5 9	" 6 6	8 0	" 9 0
1952	9 0	" 10 0	11 6	" 17 0	6 0	" 6 6	8 6	" 9 6
1953	10 0	" 12 0	15 0	" 18 0	7 0	" 8 0	11 6	" 12 6
1954	15 0	" 17 0	20 0	" 21 0	9 0	" 10 0	14 0	" 15 0
1955	17 0	" 20 0	24 0	" 26 0	10 0	" 11 0	15 0	" 16 0
1956	18 0	" 21 0	27 0	" 28 6	11 6	" 13 0	16 6	" 17 6
1957	..	..	22 0	" 24 0	11 0	" 12 6	16 0	" 17 0
1958	..	..	16 0	" 18 0	..	..	8 0	" 8 6

\* No Cheviots smeared now.

† No Highlands smeared now.

## GENERAL SHOW AT ABERDEEN, 1908.

MORE favourable weather than that which was experienced at the Aberdeen Highland Show of 1908 could hardly be desired. Barring a very slight shower on the Wednesday evening, there was no rain during the Show, and the ground remained throughout in a comfortable condition. The irregularities of the ground militated against the symmetrical arrangement of the Show, yet on the whole the Links formed a convenient Showyard.

Thanks in some measure to the delightfully fine weather and the dry site, the attendance of the public was exceptionally large, and in a financial sense the Show met with substantial success. The accounts exhibit a credit balance of £1881, which is the most favourable result yet attained at Aberdeen. The surplus exceeds by £200 that of the Aberdeen Show of 1894, which was visited by H.R.H. the Prince of Wales (then Duke of York), and this is all the more encouraging in view of the fact that while the amount of prize-money offered by the Society in 1894 was barely £2000, it reached the sum of £2521 in 1908—an increase of over £500. For this gratifying result the Society is largely indebted to the liberality and public spirit of the Show district. The owners and occupiers of land in the counties of Aberdeen, Banff, Kincardine, and Forfar (Eastern Division) contributed no less than £1145 in aid of the Show, while the city of Aberdeen gave a sum of £100 in addition to the use of the Show ground and a supply of water free of charge.

As a display of live stock the Show was a conspicuous success. Larger entries have sometimes been recorded, but in regard to general standard of merit a higher level has rarely been reached. This, too, applies almost equally to all varieties of live stock. And in the implement department there was no falling off from the high character of recent years.

*Statistics.*

The following tables give the number of entries in the various sections :—

## 1. CATTLE.

Class.	SHORTHORN.						No. of Entries.
1. Aged bulls . . . . .	.	.	.	.	.	.	16
2. Two-year-old bulls . . . . .	.	.	.	.	.	.	22
3. One-year-old bulls . . . . .	.	.	.	.	.	.	15
4. Cows of any age . . . . .	.	.	.	.	.	.	11
5. Two-year-old heifers . . . . .	.	.	.	.	.	.	11
6. One-year-old heifers . . . . .	.	.	.	.	.	.	19

## ABERDEEN-ANGUS.

7. Aged bulls . . . . .	15
8. Two-year-old bulls . . . . .	10
9. One-year-old bulls . . . . .	10
10. Cows of any age . . . . .	14
11. Two-year-old heifers . . . . .	16
12. One-year-old heifers . . . . .	19
	— 84

## GALLOWAY.

13. Aged bulls . . . . .	5
14. Two-year-old bulls . . . . .	3
15. One-year-old bulls . . . . .	6
16. Cows of any age . . . . .	7
17. Two-year-old heifers . . . . .	7
18. One-year-old heifers . . . . .	9
	— 37

## HIGHLAND.

19. Aged bulls . . . . .	5
20. Two-year-old bulls . . . . .	4
21. One-year-old bulls . . . . .	10
22. Cows of any age . . . . .	6
23. Three-year-old heifers . . . . .	11
24. Two-year-old heifers . . . . .	11
	— 47

## AYRSHIRE.

25. Aged bulls . . . . .	2
26. Two-year-old bulls . . . . .	5
27. One-year-old bulls . . . . .	6
28. Cows in milk, calved before 1905 . . . . .	3
29. Cows in milk, calved after 1st January 1905 . . . . .	3
30. Cows of any age, in calf, or heifers calved in 1905, in calf, and due to calve within nine months after the Show . . . . .	6
31. Two-year-old heifers . . . . .	3
32. One-year-old heifers . . . . .	4
	— 32

## FAT CATTLE.

33. Oxen, any pure breed or cross, calved after 1st December 1905 . . . . .	11
34. Oxen, any pure breed or cross, calved after 1st December 1906 . . . . .	13
35. Heifers, any pure breed or cross, calved after 1st December 1905 . . . . .	5
36. Heifers, any pure breed or cross, calved after 1st December 1906 . . . . .	7
Extra Stock . . . . .	1
	— 37
	<u>331</u>

## 2. HORSES.

## DRAUGHT STALLIONS.

37. Aged stallions . . . . .	15
38. Three-year-old entire colts . . . . .	17
39. Two-year-old entire colts . . . . .	27
40. One-year-old entire colts . . . . .	14
	— 73

## DRAUGHT GELDINGS.

41. Aged geldings . . . . .	10
42. Three-year-old geldings . . . . .	3
43. Two-year-old geldings . . . . .	6
	— 19

## DRAUGHT MARES AND FILLIES.

44. Mares with foal at foot . . . . .	3
45. Yeld mares, foaled before 1905 . . . . .	8
Extra stock . . . . .	1
46. Three-year-old yeld mares, or fillies . . . . .	13
47. Two-year-old fillies . . . . .	16
48. One-year-old fillies . . . . .	10
	— 51

## HUNTERS.

49. Colt, gelding, or filly, foaled in 1907, the produce of thoroughbred stallions out of mares of any breed . . . . .	6
50. Filly, mare, or gelding, for field, foaled in 1906 . . . . .	10
51. Yeld mare, filly, or gelding, for field, foaled in 1905 . . . . .	5
52. Hunter brood mares, with foal at foot . . . . .	5
	— 26

## HACKNEYS.

53. Brood mares, 15 hands and upwards, with foal at foot, or to foal this season to a registered sire . . . . .	5
54. Brood mares, under 15 hands, with foal at foot, or to foal this season to a registered sire . . . . .	2
55. Yeld mares or fillies, three years old . . . . .	2
56. Fillies, two years old . . . . .	2
57. Fillies, one year old . . . . .	1
58. Stallions, foaled in or before 1905, over 15 hands . . . . .	2
59. Stallions, foaled in or before 1905, over 14 and not over 15 hands . . . . .	2
60. Entire colts, two years old . . . . .	3
61. Entire colts, one year old . . . . .	3
	— 22

## PONIES.

62. Stallions, 3 years old and upwards, 14 hands and under . . . . .	4
63. Yeld mares, fillies, or geldings, 3 years old and upwards, over 13 and not over 14 hands . . . . .	4
64. Yeld mares, fillies, or geldings, 3 years old and upwards, over 12 and not over 13 hands . . . . .	5
65. Yeld mares, fillies, or geldings, 3 years old and upwards, 12 hands and under . . . . .	3
	— 16

## COBS.

66. General purpose cob, gelding, mare, or filly, not eligible by pedigree for any of the other classes, over 3 years old, 14.2 hands upwards —in saddle . . . . .	0
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## HIGHLAND PONIES.

67. Stallions, 3 years old or upwards, not exceeding 14.2 hands, entered or accepted for entry in the Highland section of the Polo Pony Stud-Book . . . . .	5
68. Entire colts, foaled in 1906 or 1907 . . . . .	2
69. Mares, 3 years old or upwards, not exceeding 14.2 hands, yeld or with foal at foot, entered or accepted for entry in the Highland section of the Polo Pony Stud-Book . . . . .	7
70. Mares, 13.2 hands and under . . . . .	2
	— 16

## SHETLAND PONIES.

71. Stallions, not exceeding 10½ hands, foaled before 1905 . . . . .	12
Extra stock . . . . .	1
72. Entire colts, not exceeding 10½ hands, foaled in 1905 or 1906 . . . . .	11
73. Mares, not exceeding 10½ hands, with foal at foot . . . . .	11
74. Yeld mares, not exceeding 10½ hands . . . . .	8
75. Fillies, not exceeding 10½ hands, foaled in 1905 or 1906 . . . . .	15
	— 58

## DRIVING COMPETITIONS.

76. Yeld mares, fillies, or geldings, any age, in harness, 15 hands and upwards	8
77. Yeld mares, fillies, or geldings, any age, in harness, under 15 hands (15)	9
Extra stock	17
	<u>1</u>
	299

## JUMPING.

1. Horses or ponies, any height	11
2. Horses or ponies, any height—handicap	11
3. Horses or ponies, any height—handicap	11
	<u>33</u>

## 3. SHEEP.

## BLACKFACE.

78. Tups above one shear	11
79. Shearling tups	22
80. Ewes above one shear, with lambs	13
81. Shearling ewes or gimmers	13
	<u>59</u>

## CHEVIOT.

82. Tups above one shear	13
83. Shearling tups	9
84. Ewes above one shear, with lambs	10
85. Shearling ewes or gimmers	8
	<u>40</u>

## BORDER LEICESTER.

86. Tups above one shear	12
87. Shearling tups	29
88. Ewes above one shear	8
89. Shearling ewes or gimmers	20
	<u>69</u>

## HALF-BRED.

90. Tups above one shear	4
91. Shearling tups	6
92. Ewes above one shear	4
93. Shearling ewes or gimmers	10
	<u>24</u>

## SHROPSHIRE.

94. Tups above one shear	2
95. Shearling tups	3
96. Ewes above one shear	2
97. Shearling ewes or gimmers	3
	<u>10</u>

## OXFORD DOWNS.

98. Shearling tups	12
99. Shearling ewes or gimmers	8
	<u>20</u>

## SUFFOLK.

100. Shearling tup	1
101. Shearling ewes or gimmers	5
102. Three ewe lambs	5
	<u>11</u>

## EXTRA SECTIONS.

103. Fat lambs, any breed or cross	4
	<u>4</u>
	237

## 4. SWINE.

## LARGE WHITE BREED.

104. Boars farrowed before 1907	.	.	.	.	.	.	4
Extra Stock	.	.	.	.	.	.	1
105. Boars farrowed in 1907	.	.	.	.	.	.	2
106. Boars farrowed in 1908	.	.	.	.	.	.	7
107. Sows farrowed before 1907	.	.	.	.	.	.	3
108. Sows farrowed in 1907	.	.	.	.	.	.	3
109. Sows farrowed in 1908	.	.	.	.	.	.	6
							— 26

## BERKSHIRE.

110. Boars, any age	.	.	.	.	.	.	5
111. Boars farrowed in 1908	.	.	.	.	.	.	3
112. Sows, any age	.	.	.	.	.	.	3
113. Sows farrowed in 1908	.	.	.	.	.	.	5
							— 16
							42

## 5. POULTRY.

1-102. Poultry.	.	.	.	.	.	.	509
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## 6. DAIRY PRODUCE.

1. Powdered butter, not less than 7 lb.	.	.	.	.	.	.	12
2. Fresh butter, 3 1-lb. rolls.	.	.	.	.	.	.	18
3. Cheddar cheese, 56 lb. and upwards	.	.	.	.	.	.	12
5. Cheese, 14 lb. and under	.	.	.	.	.	.	12
							— 54

## ABSTRACT.

	No. of Entries.
1. Cattle	331
2. Horses	299
3. Sheep	237
4. Swine	42
5. Poultry	509
6. Dairy produce	54

The following table gives a comparative view of the display of cattle, horses, sheep, swine, poultry, dairy produce, and implements, of the value of the premiums offered, and of the receipts at the entrance-gates, grand stands, and for catalogues at the Shows which have been held at Aberdeen:—

Year.	Cattle.	Horses.	Sheep.	Wool.	Swine.	Poultry.	Dairy Produce.	Butter-making.	Implements.	Premiums.	Receipts.
1834 .	188	77	77	...	44	...	28	...	9	£827	£337
1840 .	269	80	51	...	40	...	46	...	30	781	586
1847 .	361	105	92	...	24	42	42	...	49	920	510
1858 .	450	189	281	...	47	122	...	...	802	1500	1,229
1868 .	873	139	260	...	39	160	...	...	1158	1600	1,577
1876 .	424	227	231	...	58	374	...	...	1812	2440	2,899
1885 .	385	223	231	...	7	252	40	...	1849	2368	3,436
1894 .	314	324	184	...	34	365	58	...	2532	2440	5,121
1902 .	330	253	243	16	42	475	48	...	1988	2796	4,413
1908 .	331	299	237	...	42	509	54	...	1931	3045	4,596

*A Comparison.*

The following figures, relating to some of the most successful Shows the Society has held, will be perused with interest:—

	Cattle.	Horses.	Sheep.	Swine.	Poultry.	Total Live Stock.	Implements.	Premi- um.	Drawings at Show.	Profit.
Glasgow, 1867 .	286	212	257	58	150	963	1344	£1600	£3,005	£1307
Edinburgh, 1869	310	212	340	22	239	1123	1900	1600	4,078	2067
Glasgow, 1875 .	411	405	296	48	479	1639	2220	2665	6,231	3816
Edinburgh, 1877	339	342	305	30	234	1250	2292	2714	6,734	3710
Edinburgh, 1884	580	453	493	35	253	1814	2282	4343	6,548	1855
Edinburgh, 1893	380	349	294	31	360	1414	2268	2600	4,918	2323
Aberdeen, 1894 .	314	324	184	34	365	1221	2532	2440	5,121	1678
Perth, 1896 .	292	258	204	20	374	1148	1945	2205	4,788	2511
Glasgow, 1897 .	317	350	245	30	275	1217	2227	2897	4,392	2021
Edinburgh, 1899	386	518	477	46	551	1978	2585	3844	10,285	3911
Stirling, 1900 .	321	288	369	28	457	1463	2095	2915	4,305	1078
Inverness, 1901.	360	257	204	22	499	1340	1460	2806	2,485	99
Aberdeen, 1902 .	330	253	243	42	475	1343	1988	2796	4,413	1604
Perth, 1904 .	348	315	283	35	413	1394	1972	3058	4,993	1828
Glasgow, 1905 .	310	462	284	60	534	1750	1875	3702	4,473	1203
Peebles, 1906 .	253	258	291	40	438	1280	1658	3072	2,596	416
Edinburgh, 1907	363	464	352	58	605	1842	2140	3614	7,061	2309
Aberdeen, 1908 .	331	299	237	42	509	1418	1931	3045	4,596	1881

*Cattle.*

High excellence in features of practical utility distinguished the display of cattle in a very marked degree. In all the breeds, symmetry, quality, breed type, and early maturity were the outstanding characteristics.

With 94 entries, Shorthorns made a highly creditable appearance, the classes of bulls being specially well filled. The President's Medal for the best Shorthorn went to Mr George Campbell, Harthill, Whitehouse, for his thick, well-proportioned bull "Tarrel Uxor" 93,622 (fig. 26), got by "Ajax" 80,320, and bred by Mr John Ross, formerly of Meikle Tarrel, now at Millcraig, Alness, Ross-shire. There was a very strong class of two-year-old Shorthorn bulls, and, on the whole, good classes of cows and heifers. The yearling heifers have sometimes shown higher average merit.

As was expected, in the Granite City the collection of Aberdeen-Angus cattle was larger than usual, and in regard to general merit the breed made a remarkably fine display. Here the President's Medal for the best animal of the breed went to Mr J. Ernest Kerr of Harviestoun Castle, Dollar, for his very straight, evenly-fleshed, two-year-old Erica bull "Elect



Fig. 26 —SHORTHORN BULL, "TARREL UXOR" 93,622.

Winner of the President's Medal for best Shorthorn, Aberdeen Show, 1908. The property of Mr George Campbell Harthill, Whitehouse, Aberdeen-shire. Bred by Mr John Ross, Mulleraig, Alness, Ross-shire. Age three years and five months.

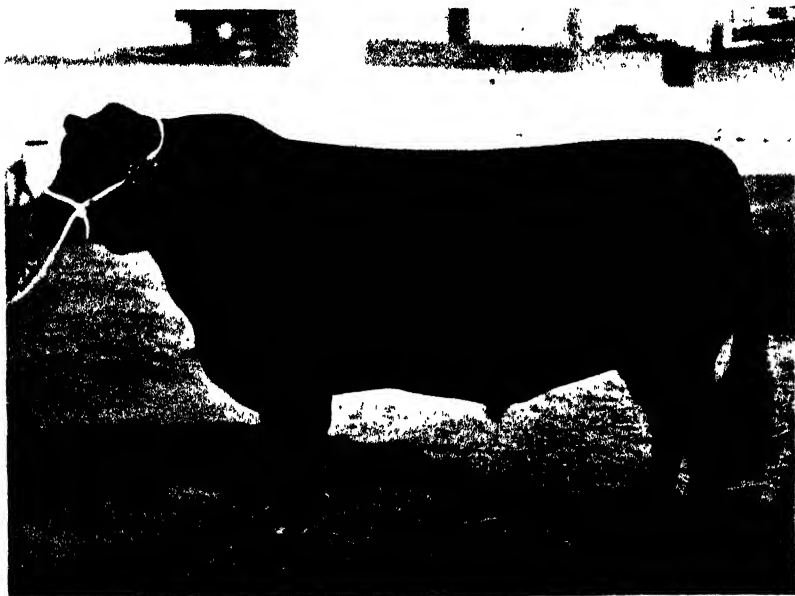


Fig. 27.—ABERDEEN-ANGUS BULL, "ELECT OF BALLINDALLOCH" 25,518.

Winner of the President's Medal for best Aberdeen-Angus animal, Aberdeen Show, 1908. The property of Mr J. Ernest Kerr of Harviestoun Castle, Dollar. Bred by the late Sir George Macpherson-Grant of Ballindalloch. Age two years and three months.



Fig. 28.—GALLOWAY BULL, "KEYSTONE" 9689.

Winner of the President's Medal for best Galloway, Aberdeen Show, 1908. The property of Mr Francis N. M. Gourlay, Broomfield, Moniaive, Dumfriesshire. Bred by Messrs Thomas Biggar & Sons, Chipelton, Dalbeattie. Age two years and seven months.

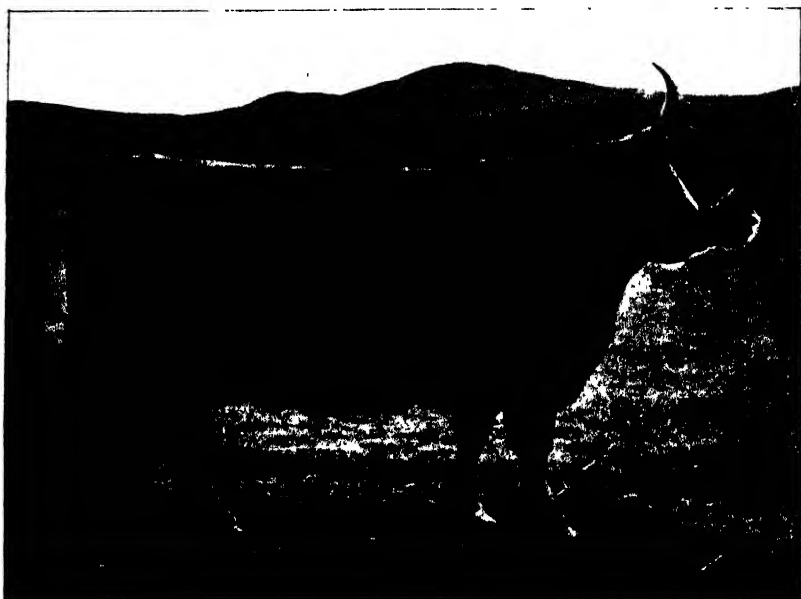


Fig. 29.—HIGHLAND COW, "LAOCHAG ISEABEL" 7396.

Winner of the President's Medal for best Highland Animal, Aberdeen Show, 1908. Bred by and the property of Mr Donald A. Stewart, Ensay, Portree. Age four years and four months.

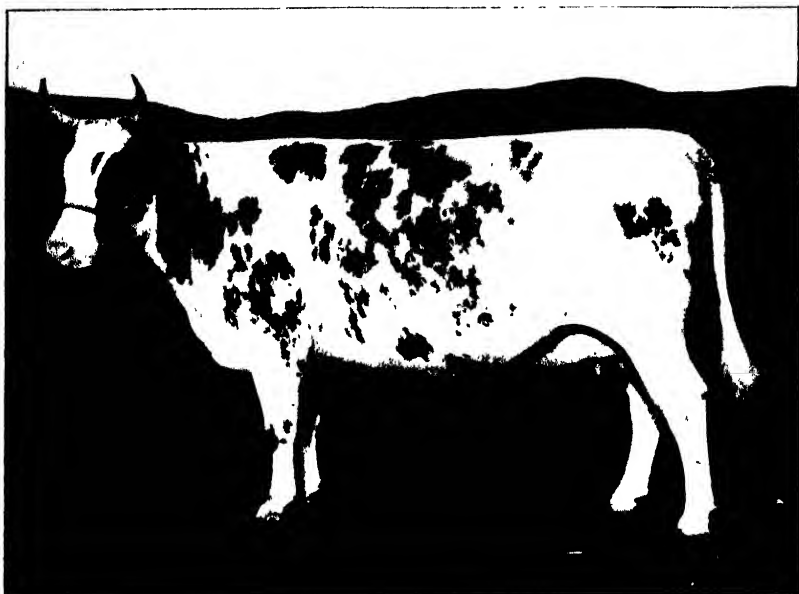


Fig. 30.—AYRSHIRE COW, "AUCHENTORLIE BLOOMER" 16,644

Winner of the President's Medal for best Ayrshire, Aberdeen Show, 1908. The property of Lieut. Col. Fergusson Buchanan of Auchentorlie, Bowling. Bred by Mr. James Laurie, West Newton, Strathaven. Age seven years and two months.



Fig. 31.—ABERDEEN-ANGUS HEIFER, "HER MAJESTY 5TH OF CULLEN" 41,169.

Winner of the President's Medal for best Fat Animal, Aberdeen Show, 1908. Bred by and the property of the Countess Dowager of Seafield, Cullen House, Cullen. Age two years and six months.

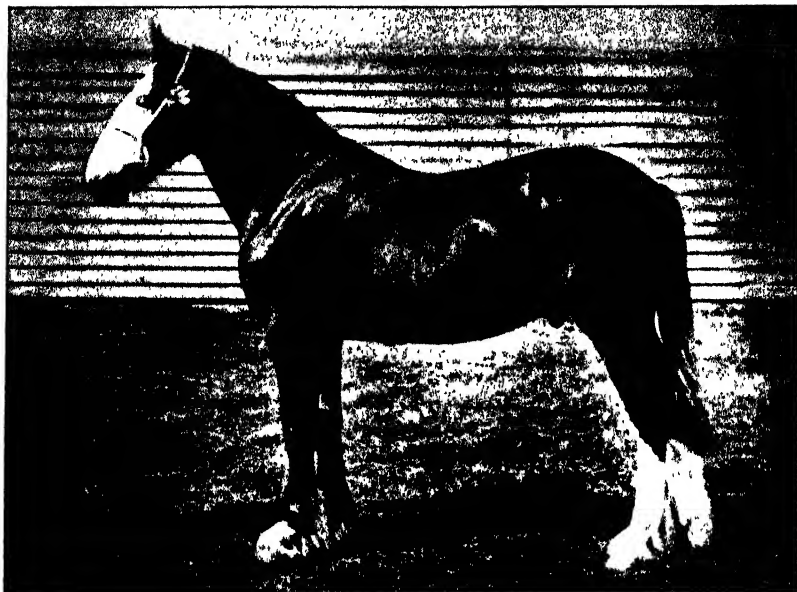


Fig. 32.—CLYDESDALE COLT.

Winner of the President's Medal for best Clydesdale Stallion or Colt, Aberdeen Show, 1908.  
The property of Messrs A. & W. Montgomery, Netherhall and Banks, Kirkeudbright  
Bred by Messrs G. & J. Cocker, Hill of Petty, Fyvie. Age one year and four months.

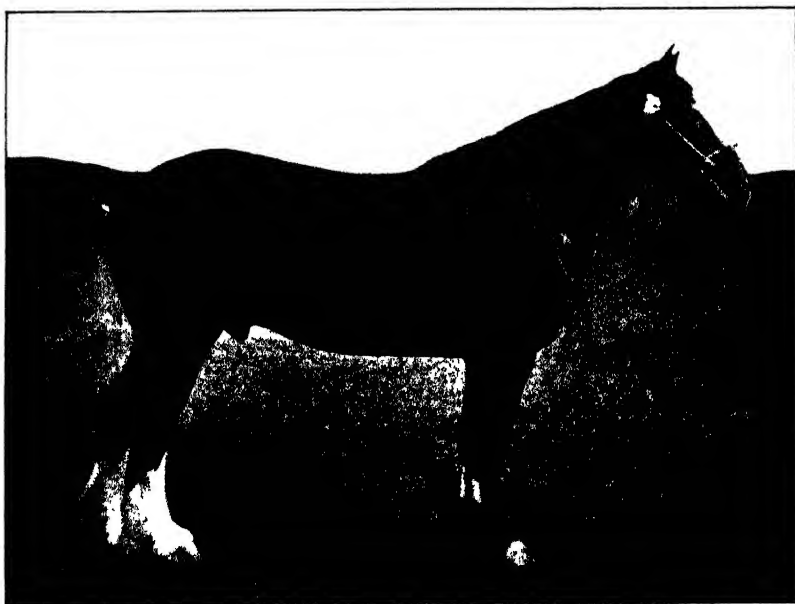


Fig. 33.—DRAUGHT GELDING, "TOM."

Winner of the President's Medal for best Draught Gelding, Aberdeen Show, 1908. The property  
of Mr William Clark, Netherlea, Cathcart. Breeder unknown. Age five years.

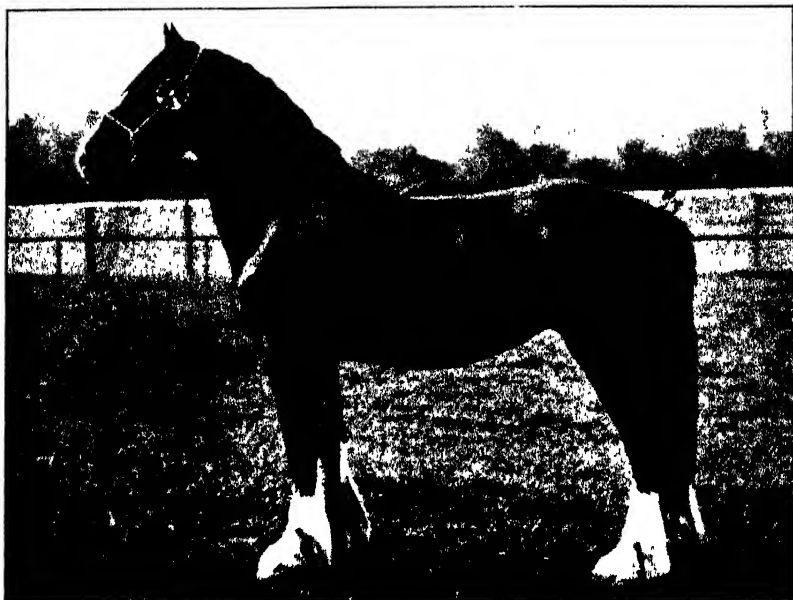


Fig. 34.—CLADESDALE FILLY, "NERISSA"

Winner of the President's Medal for best Clydesdale Mare or Filly, Aberdeen Show, 1908. Bred by and the property of Mr J. Ernest Kerr of Harviestoun Castle, Dollar. Age two years.



Fig. 35.—HUNTER GELDING, "SURPRISE"

Winner of the President's Medal for best Hunter, Aberdeen Show, 1908. Bred by and the property of Captain Clayhills Henderson, R.N., of Invergowie, Dundee. Age two years.

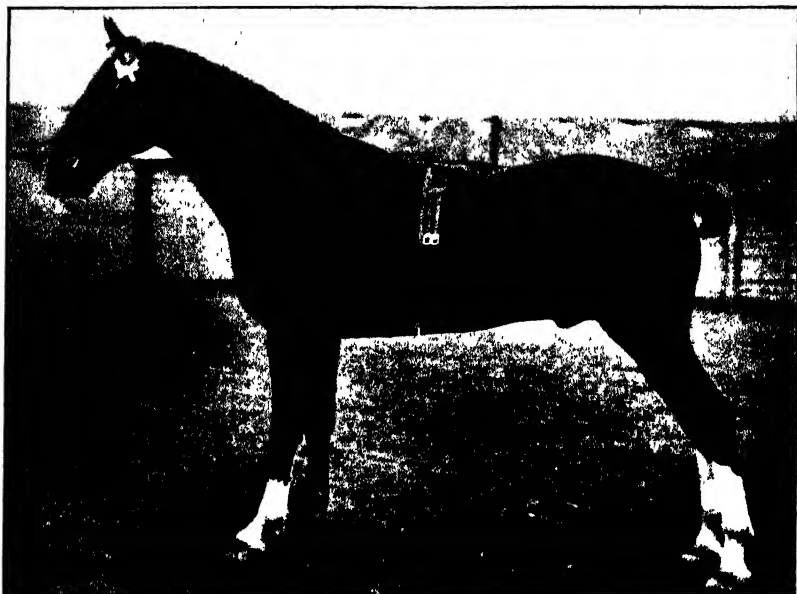


Fig. 36.—HACKNEY COLT, "ADDERLEY" 10,051.

Winner of the President's Medal for best Hackney, Aberdeen Show, 1908. Bred by and the property of Mr John Smith, Adderley, Monifieth. Age two years.



Fig. 37.—PONY MARE, "BELLE OF NEW YORK."

Winner of the President's Medal for best Pony, Aberdeen Show, 1908. The property of Mr George M'Donald, Roedene, Dumbreck, Glasgow. Bred by Mr S. R. Flowerday, Sheffield. Age six years.

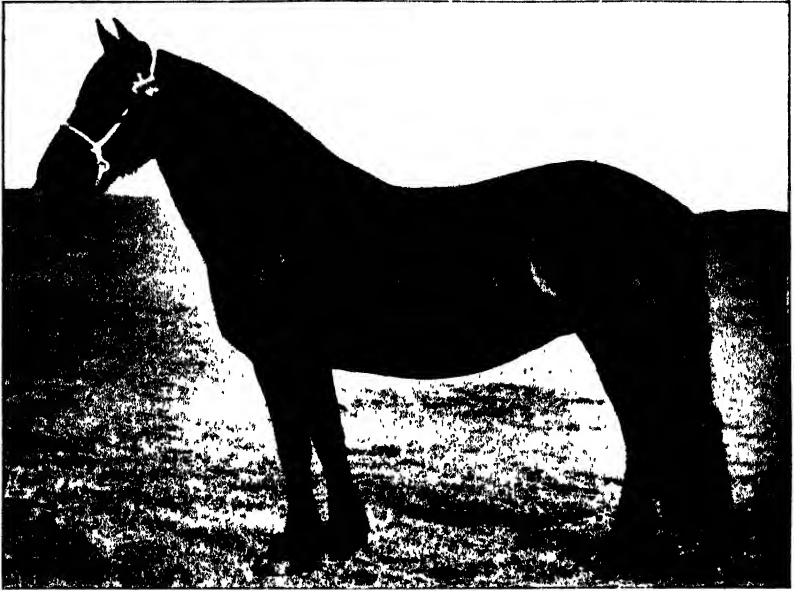


Fig. 38.—HIGHLAND PONY MARE, "BRAUTIN."

Winner of the President's Medal for best Highland Pony, Aberdeen Show, 1908. The property of Mr W. Dalziel Mackenzie of Farr, Daviot. Bred by Mr Colin Macdonald, Camusmunn, Kyle of Lochalsh. Age thirteen years.



Fig. 39.—SHETLAND PONY STALLION, "CROWN PRINCE" 312.

Winner of the President's Medal for best Shetland Pony, Aberdeen Show, 1908. Bred by and the property of Mr Charles Douglas of Auchlochun, Lesmahagow. Age six years.

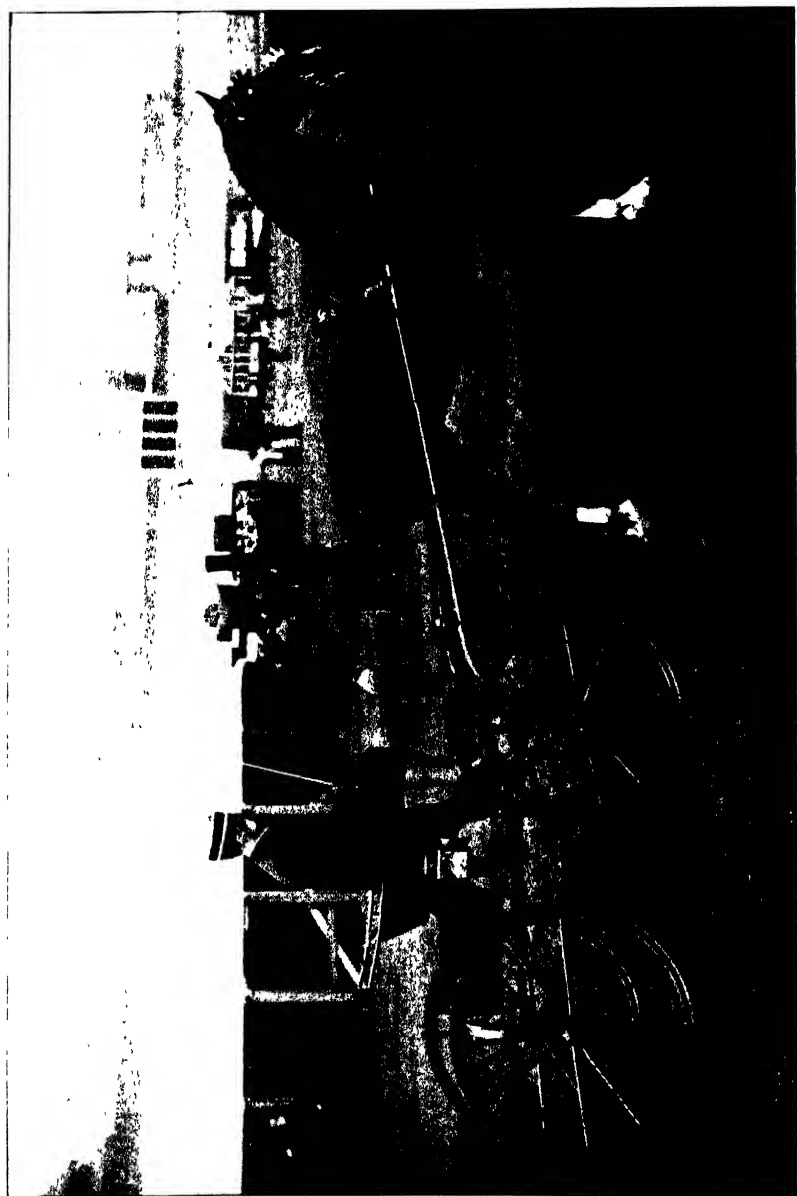


Fig. 40.—HACKNEY MARE, "MARGARETTA," 16,756.

Winner of the President's Medal for best animal in Driving Class, Aberdeen Show, 1908. The property of Mr. William S. Miller, Glendernutt, Craigmore, B'co. Bred by Mr. W. Burdett Coates M.P. Age five years.



Fig. 11.—BLACKFACE EWE.

Winner of the President's Medal for best Blackface Sheep, Aberdeen Show, 1908. The property of Mr James Clark, Crossflatt, Minkuk. Bred by Mr Thomas Hope, Brownhill, Strathaven. Age five shear.



Fig. 12.—CHEVIOT TUP, "LORD CROMER."

Winner of the President's Medal for best Cheviot Sheep, Aberdeen Show, 1908. Bred by and the property of Mr J. R. C. Smith, Mowhaugh, Yetholm. Age two shear.

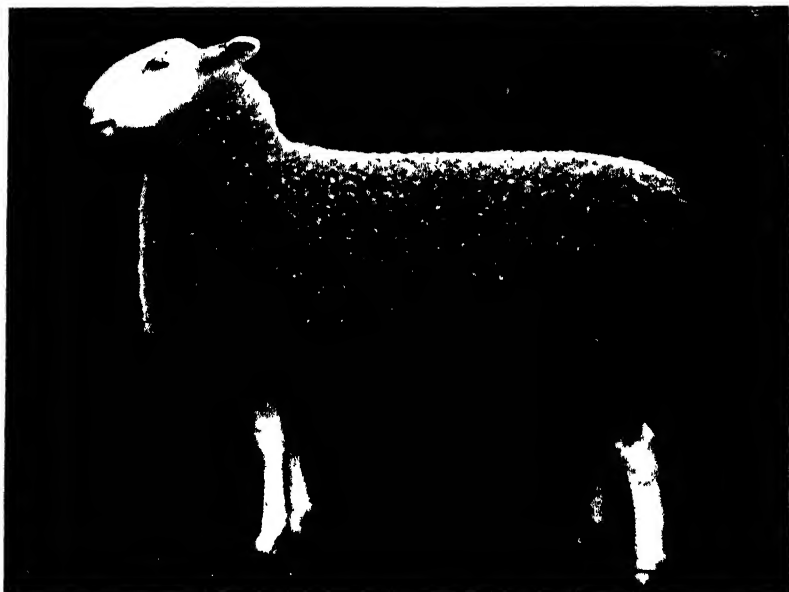


Fig. 43 — BORDER LEICESTER SHEARLING EWE.

Winner of the President's Medal for best Border Leicester, Aberdeen Show, 1908. Bred by and the property of Messrs Archibald Cameron & Sons, Westside Farm, Bitchin.

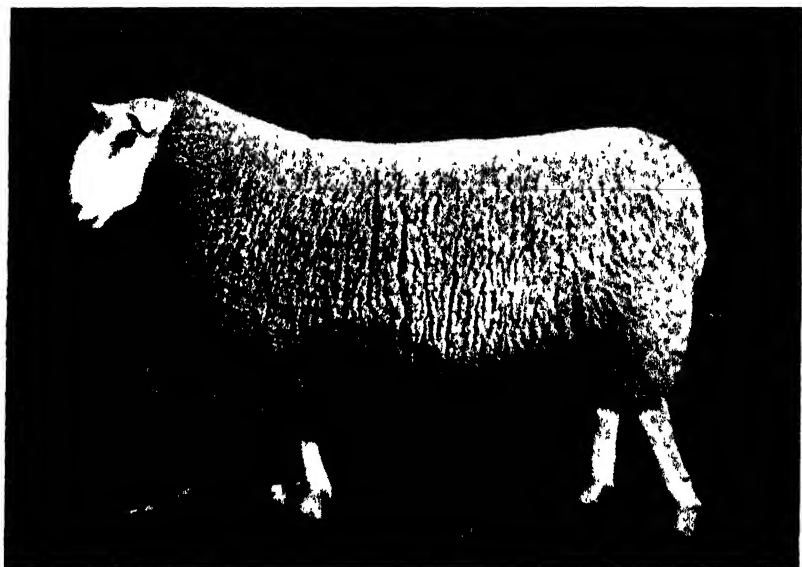


Fig. 44.—HALF-BRED SHEARLING TUP.

Winner of the President's Medal for best Half-Bred, Aberdeen Show, 1908. The property of Mr John Mark, Sunnyside, Prestonkirk. Bred by Mr J. Jeffrey, Deuchrie, Prestonkirk.



Fig. 45.—SHROPSHIRE SHEARLING TUP.

President's Medal for best Shropshire, Aberdeen Show, 1908. Bred by and the property of Mr Thomas A. Buttar, Ceorston, Coupar Angus.



Fig. 46.—OXFORD DOWN SHEARLING TUP.

Winner of the President's Medal for best Oxford Down, Aberdeen Show, 1908. Bred by and the property of Mr James T. Hobbs, Maisey Hampton, Fairford, Gloucester.

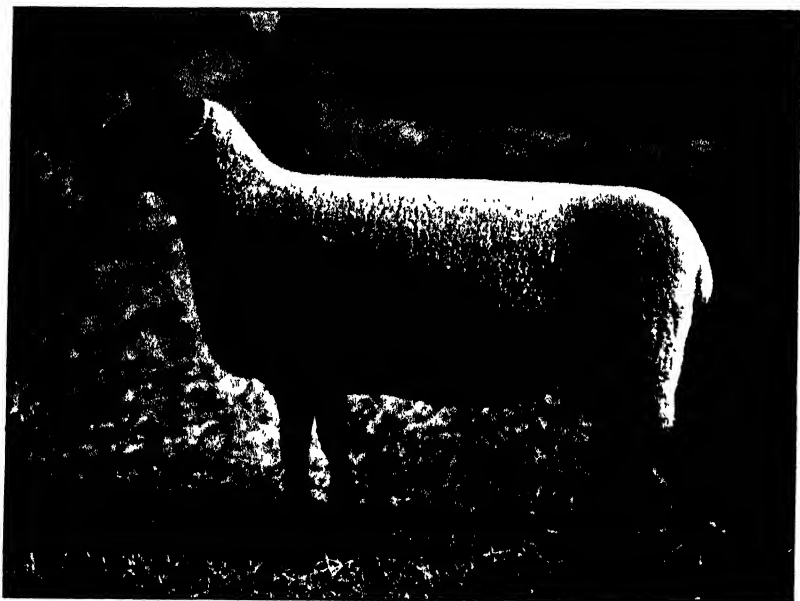


Fig. 47.—SUFFOLK SHEARLING EWE.

Winner of the President's Medal for best Suffolk Sheep, Aberdeen Show, 1908. Bred by and the property of Mr William Ford, Fentonbarns, Drem.

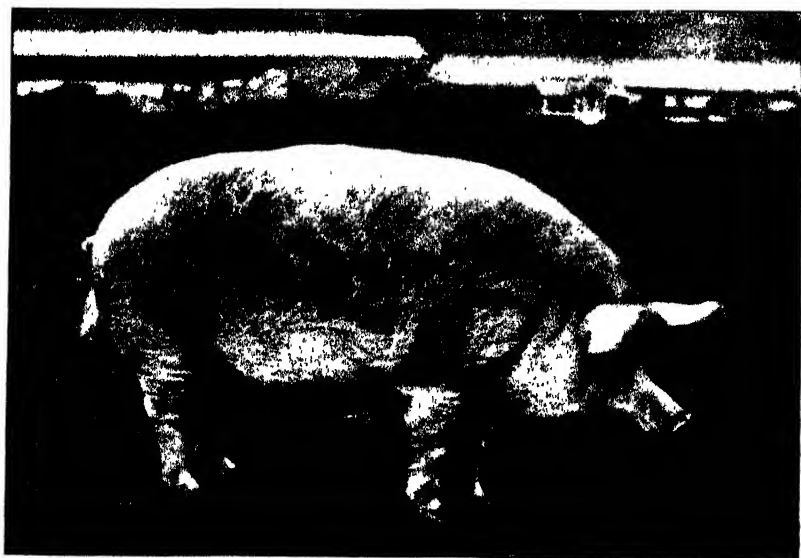


Fig. 48. —LARGE WHITE BOAR, "BROOMHOUSE HERCULES" 9031.

Winner of the President's Medal for best pen of Swine, Aberdeen Show, 1908. The property of Mr W. B. Wallace, Broomhouse, Corstorphine. Bred by the late Mr John Barron, Borrowash, Derby. Age five years.

of Ballindalloch" 25,518 (fig. 27), bred by the late Sir George Macpherson Grant, Bart., of Ballindalloch, and got by "England" 23,124, the sire of his dam having been the well-known bull "Delamere" 13,305. The female classes of this breed contained many animals of the choicest quality and character, the best amongst them being Mr James Kennedy's beautiful cow "Euroto" 39,206, which won the Ballindalloch Challenge Cup for the best cow of the breed.

It is not surprising that, so far from their home, Galloway cattle were present in small numbers. In merit, however, there was no lacking. All over, the classes of the breed attained a very high standard in character and quality. One of the most handsome bulls exhibited for several years was Mr F. N. M. Gourlay's two-year-old bull "Keystone" 9689 (fig. 28), which won the President's Medal for the best animal of the breed. This exceptionally attractive bull was bred by Messrs Biggar & Sons, Chapelton, Dalbeattie, and got by "Excelsior" 7702.

Highland cattle also made an excellent appearance. The female classes of this breed were exceptionally strong in merit, and it was therefore fitting that the President's Champion Medal should have gone to the first-prize cow, "Laochag Iseabel" 7396 (fig. 29), owned by Mr Donald A. Stewart, Ensay, Portree. This strikingly handsome cow was bred by Mr Stewart, and was got by "Rhu na Scarbh" 1410. The bull classes also included a number of excellent representatives of the breed.

In the case of Ayrshire cattle also the classes were small, but here again the average standard of merit was high. As usually happens with this famous milking breed, a leading winner in the cow classes carried off the Champion Medal. This was Colonel Fergusson-Buchanan's finely-shaped cow "Auchentorlie Bloomer" 16,644 (fig. 30), bred by Mr James Laurie, High Newton, Strathaven, got by "Sir John of Old Graitney" 4035.

As in former years at Aberdeen, there were classes for fat cattle, and on this occasion they were fairly well filled. It is interesting to record that the President's Champion Medal here was won by Countess-Dowager of Seafield with that beautiful Aberdeen-Angus heifer "Her Majesty 5th of Cullen" 41,169 (fig. 31), which carried off the "Blue Ribbon" of the Smithfield Show last December.

### *Horses.*

It was the general opinion of visitors to the Show that Clydesdale horses have seldom more strongly displayed their high excellence in quality and action than on this occasion. Breeders from south of the Border would have liked greater weight, but they were loud in their praises of the Clydesdales

in conformation of body, feet, and limbs, and also in cleanness and flatness of bone and general action. In strong classes of Clydesdale stallions and colts the Champion was found in Messrs A. & W. Montgomery's very promising first prize yearling colt (fig. 32). This handsome colt was bred by Messrs Cocker, Hill of Petty, Fyvie, and got by "Baron's Pride" 9122, and out of "Lady Ida" 15,438.

There was a small but very good show of Draught Geldings. Here the President's Medal went to Mr William Clark, Netherlea, Cathcart, for "Tom" (fig. 33), a strongly-built five-year-old of unknown breeding.

Clydesdale Mares and Fillies mustered strongly. The President's Medal here was won by Mr J. Ernest Kerr of Harviestoun Castle, Dollar, with the stylish two-year-old filly "Nerissa" (fig. 34), bred by himself and got by "Baron's Pride" 9122, and out of "Nellie" 16,782 by "Royal Favourite" 10,630. This handsome filly also won finally for Mr Kerr the Cawdor Challenge Cup for the best Clydesdale mare or filly.

The show of Hunters was not large, but on the whole it was of a satisfactory character. Captain Clayhills Henderson of Invergowrie won the President's Champion Medal with "Surprise" (fig. 35), a well-formed, clean-boned, two-year-old gelding of his own breeding, got by "Barmante."

Hackneys made an exceptionally small display, yet it included a few animals of decidedly high merit. The Champion Medal here was won by Mr John Smith, Adderley, Monifieth, for "Adderley" 10,054 (fig. 36), a strongly-built two-year-old colt bred by Mr Smith, and got by "Copper King" 7764.

Still smaller in number were the entries of Ponies, but here again there was merit of the highest order. The President's Medal for the best pony went to Mr George M'Donald, Roedene, Dumbreck, Glasgow, for "Belle of New York" (fig. 37), an active, good-looking, six-year-old mare bred by Mr S. R. Flowerday, Sheffield, and got by "Paddock Polonius" 7208.

The muster of Highland Ponies was quite creditable, sixteen ponies having been entered in four classes. Mr W. D. MacKenzie of Farr won the Champion Medal for "Braulin" (fig. 38), a remarkably well-built aged mare bred by Mr Colin MacDonald, Camuslinnie, Kyle of Lochalsh.

As usual, Shetland Ponies made an attractive display. There were close on sixty entries, and in all the classes there was keen competition. Mr Charles Douglas of Auchlochan, Lesmahagow, won the Champion Medal here with his beautiful six-year-old stallion "Crown Prince" 342 (fig. 39). This characteristic pony was bred by Mr Douglas, and was got by "Frederick" 223 out of "Brassolis" 1193 by "Odin" 32.

The turnout in the Driving classes was better than in most

recent years. The Champion Medal in these classes went to Mr W. S. Miller, Glendermott, Bute, for "Margaretta" 16,786 (fig. 40), a stylish five-year-old Hackney mare bred by Mr W. Burdett-Coutts, M.P.

### *Sheep, Swine, &c.*

The collection of Sheep was large and of high merit. All the Scottish breeds were strongly represented. The winners of the President's Champion Medals are shown in figs. 41, 42, 43, 44, 45, 46, and 47.

The show of Swine was very good, though most of the classes were small. As at Edinburgh in 1907, the Champion Medal went to Mr W. B. Wallace, Broomhouse, Corstorphine, for his famous Large White boar "Broomhouse Hercules" 9031 (fig. 48).

There were excellent displays in both the Poultry and Dairy Produce sections.

### M'AINSH-ROBERTSON STACK-RACK.

On Stand 148, Messrs John M'Ainsh and Charles Robertson, Strathbraan, Dunkeld, Perthshire, exhibited a new patent Stack-Rack for drying and preserving grain crops. This Rack aroused much interest in the Showyard, and having made inquiries regarding the working of it on several farms during the past season, the Directors of the Society, at their meeting on 7th April 1909, awarded the Society's Gold Medal to the inventors in recognition of the merits of the Rack.

In the past season the Rack was tried on about twenty farms, and the results were on the whole highly satisfactory. In most cases barley or oat crops put right into the Rack from the reaper or binder were kept in excellent condition through the winter.

The Rack is made in divisions which can be extended indefinitely, the whole being portable and simple in construction. It is intended that in next volume of the 'Transactions' a description of the Rack will be given along with information as to the results obtained from its use.

### COMBINED PLOUGH AND DRILL MANURE DISTRIBUTOR.

Upon Stand No. 4 Mr James Rugg, Keiss, Wick, exhibited a Combined Plough and Single-Drill Artificial Manure Distributor, which was inspected with a good deal of interest.

The distributing apparatus consists essentially of a hopper, which is attached, on one side, by means of a hinged joint to the frame of an ordinary plough. The other side of the hopper is supported by the axle of a wheel, which rides on the top of an adjoining drill; it can be adjusted to suit drills from 25 inches to 30 inches wide. The object of the hinged joint is to allow the apparatus to have a freedom of movement in a vertical direction so that it may readily adapt itself to any inequalities in the ground.

The manure is drawn from the bottom of the hopper by means of an endless chain, which is driven from the above-

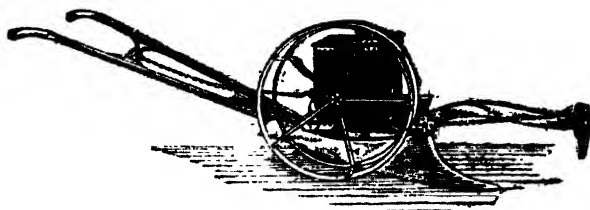


Fig. 49.—*Combined Plough and Single-Drill Manure Distributor.*

mentioned wheel, and the manure is delivered into the drill immediately after the latter is made by the plough. The amount of manure sown can be varied, and the distributor is thrown out of action by pulling a chain placed near the plough handles.

The apparatus is simple in construction, and appears to be effective in working. It should prove a specially suitable implement for small holdings.

The general design of the combination is shown in fig. 49. The price is £3, 10s.

# PREMIUMS AWARDED BY THE SOCIETY IN 1908.

## 1.—ABERDEEN SHOW

*21st, 22nd, 23rd, and 24th July 1908.*

ABBREVIATIONS.—V., *Very Highly Commended.* H., *Highly Commended.*  
C., *Commended.*

### CATTLE

#### SHORTHORN.

*PRESIDENT'S CHAMPION MEDAL for best Shorthorn.*

George Campbell, Harthill, Whitehouse, Aberdeenshire, "Tarrel Uxor" (93,622).

*Best Shorthorn Bull in the Show, entered or eligible for entry in Coates's Herd-Book—  
£25, given by the Shorthorn Society.*

George Campbell, Harthill, Whitehouse, Aberdeenshire, "Tarrel Uxor" (93,622).

*Breeder of best Bull of any age in Classes 1, 2, and 3—The Silver Medal.*

John Ross, Meikle Tarrel, Alness, "Tarrel Uxor" (93,622).

CLASS 1. BULL, calved before 1906.—Premiums, £15, £10, £5, and £3.

1. George Campbell, Harthill, Whitehouse, Aberdeenshire, "Tarrel Uxor" (93,622).
2. His Majesty the King, The Royal Farms, Windsor, "Royal Windsor" (93,289).
3. Major Stirling of Fairburn, Muir of Ord, N.B., "Westside Broadhooks" (93,860).
4. George Campbell, Harthill, Whitehouse, Aberdeenshire, "Moonstone" (86,692).
- V. John Wilson, Lower Pirriesmill, Huntly, "Golden Hero" (91,857).
- H. David Anderson, North Loinston, Aberdeen, "Sittyton Royal" (93,479).
- C. James A. Gordon, Arabella, Nigg Station, N.B., "Roan Rex" (93,120).
- C. Lumsden & Mackenzie, Huntingtowerfield, Perth, "Broadhooks Challenger" (91,058).
- C. The Duke of Richmond and Gordon, K.G., Gordon Castle, Fochabers, N.B. "Archer's Fame" (94,032).
- C. John & A. G. Ross, Millcraig, Alness, "Tarrel Ivory" (93,614).

**CLASS 2. BULL, calved in 1906.—Premiums, £15, £10, £5, and £3.**

1. His Majesty the King, The Royal Farms, Windsor, "Evander" (95,106).
2. James M'William, Garbity, Orton Station, "Bletchley King."
3. John & A. G. Ross, Millcraig, Alness, "Tarrel Myrtellus" (97,405).
4. Colonel George Smith Grant, Minmore, Glenlivet, Ballindalloch, "Minmore Chief" (96,099).
- V. James M'William, Garbity, Orton Station, "Silver Link."
- H. Charles Napier, Nether Dallachy, Banff, "Coastguard Captain."
- C. W. A. Dron, Criefvechter, Crief, "Best of Gifts."
3. James A. Gordon, Arabella, Nigg Station, "Arabella Highland Chief" (94,022).
- C. Alexander Murray, Old Manse, Boyndie, Banff, "Lord North" (95,859).

**CLASS 3. BULL, calved in 1907.—Premiums, £12, £8, £4, and £2.**

1. George Harrison, Gainford Hall, Darlington, "Collynie Champion."
2. Alexander T. Gordon, Combscausway, Inch, "Count Fascinator."
3. James M'William, Garbity, Orton Station, "Baron Orton."
4. John & A. G. Ross, Millcraig, Alness, "Lord Ivory."
- V. J. & J. Calder, Ardargie Home Farm, Forgandenny, "Keir Raiders."
- H. Colonel George Smith Grant, Minmore, Glenlivet, Ballindalloch, "Brandsby's Viceroy 2nd."
- C. Alexander T. Gordon, Combscausway, Inch, "Bandmaster."
- C. Messrs Law, Mains of Sanquhar, Forres, "Sanquhar Magnet."

*Special Prize of £10 offered by the Shorthorn Society for the best Yearling Shorthorn Bull belonging to an exhibitor residing within the counties of Elgin, Banff, Aberdeen, Kincardine, and Forfar.*

Alexander T. Gordon, Combscausway, Inch, "Count Fascinator."

*Best Shorthorn Female in the Show, entered or eligible for entry in Coates's Herd-Book—£25, given by the Shorthorn Society.*

His Majes y the King, The Royal Farms, Windsor, "Marjorie."

**CLASS 4. COW, of any age, in Milk.—Premiums, £12, £8, £4, and £2.**

1. A. G. Maxtone Graham, Redgorton, Perth, "Cluny Crocus."
2. George Harrison, Gainford Hall, Darlington, "Dalmeny Rosemary."
3. James Durno, Jackstown, Rothienorman, "Nonpareil 40th."
4. Alexander T. Gordon, Combscausway, Inch, "Belinda 9th."
- V. Colonel George Smith Grant, Minmore, Glenlivet, Ballindalloch, "Augusta of Minmore 2nd."
- H. James Durno, Jackstown, Rothienorman, "Letty Lind 2nd."
- C. J. & J. Calder, Ardargie Home Farm, Forgandenny, "Kitty Gray."
- C. John Young, Tilbouries, Maryculter, "Rosetta 16th."

**CLASS 5. HEIFER, calved in 1906.—Premiums, £10, £5, £3, and £2.**

1. His Majesty the King, The Royal Farms, Windsor, "Marjorie."
2. James M'William, Garbity, Orton Station, "Golden Baroness."
3. George Campbell, Harthill, Whitehouse, Aberdeenshire, "Millcraig Marigold 3rd."
4. George Harrison, Gainford Hall, Darlington, "Elvetham Ruth."
- V. Colonel Charles Munro, Mains of Murthly, Aberfeldy, "Guinea Bird 6th."
- H. Donald Ferguson, Dalcapon Farm, Ballinluig, "Clematis 3rd."
- C. Alexander Watson, Bruceland, Elgin, N.B., "Bess."

**CLASS 6. HEIFER, calved in 1907.—Premiums, £10, £5, £3, and £2.**

1. George Harrison, Gainford Hall, Darlington, "Cinderella 14th."
2. James Morrison, Phingask, Fraserburgh, "Phingask Broadhooks 2nd."
3. John & A. G. Ross, Millcraig, Alness, "Bannockburn Marchioness."
4. Sir James Sivewright, K.C.M.G., Tulliallan, Kincardine-on-Forth, "Queen of Diamonds."
- V. C. M. Cameron, Balnakyle, Munloch, "Dandy 23rd."
- H. Andrew S. Elliot, Hollybush, Galashiels, "Heather Bell."
- C. Alexander T. Gordon, Combscausway, Inch, "Duchess of Gordon."
- C. Alexander Watson, Bruceland, Elgin, N.B., "Red Russia"

ABERDEEN-ANGUS.

*PRESIDENT'S CHAMPION MEDAL for best Aberdeen-Angus Animal.*

J. E. Kerr of Harviestoun, Dollar, "Elect of Ballindalloch" (25,518).

*Best Bull of any age in Classes 7, 8, and 9*—Ballindalloch Challenge Cup, value £50 given by the late Sir George Macpherson Grant, Bart.

J. E. Kerr of Harviestoun, Dollar, "Elect of Ballindalloch" (25,518).

*Best Breeding Male Animal of the Breed in the Showyard*—Champion Gold Medal, given by the Polled Cattle Society.

J. E. Kerr of Harviestoun, Dollar, "Elect of Ballindalloch" (25,518).

*Breeder of best Bull of any age in Classes 7, 8, and 9*—The Silver Medal.

The late Sir George Macpherson Grant, Ballindalloch, N.B., "Elect of Ballindalloch" (25,518).

*Breeder of the Winner of the Ballindalloch Challenge Cup*—The Silver Medal.

The late Sir George Macpherson Grant, Ballindalloch, N.B., "Elect of Ballindalloch" (25,518).

**CLASS 7. BULL**, calved before 1st December 1905.—

Premiums, £15, £10, £5, and £3.

1. D. M. MacRae of Stenhouse, Thornhill, Dumfriesshire, "Everlasting of Ballindalloch" (24,435).
2. John Stewart Clark, Dundas Castle, South Queensferry, "April Fool of Drumfad" (22,866).
3. Patrick Chalmers, Aldbar Castle, Brechin, "Elsyr" (23,110).
4. George Smith Grant, Auchorachan, Glenlivet, "Ephorus" (23,139).
- V. John Macpherson, Mulben, Keith, "Imry" (24,553).
- H. Alexander M'Laren, Auchnaguie, Tullymet, Ballinluig, Perthshire, "Erello" (21,861).
- C. John R. Findlay, Aberlour Home Farm, Aberlour, "Blizzard" (24,175).
- C. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Ebbero" (20,399).
- C. The Countess-Dowager of Seafield, Home Farm, Cullen House, Banffshire, Cullen, "Erasmus of Eshott" (21,856).

**CLASS 8. BULL**, calved on or after 1st December 1905.—

Premiums, £15, £10, £5, and £3.

1. J. E. Kerr of Harviestoun, Dollar, "Elect of Ballindalloch" (25,518).
2. George Cran, Morlich, Glenkindie, "Just Jeshurun of Morlich" (25,823).
3. Andrew Brooks, North Elphinstone, Tranent, "Eagle of Dalmeny" (25,458).
4. Patrick Chalmers, Aldbar Castle, Brechin, "Pageant of Banks" (27,236).
- V. George Smith Grant, Auchorachan, Glenlivet, "Black Joker of Ballindalloch" (25,340).
- H. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Raphael of Dalmeny" (26,274).
- C. Patrick Strachan, East Town, Tarland, "Isidorus" (25,760).

**CLASS 9. BULL**, calved on or after 1st December 1906.—

Premiums, £12, £8, £4, and £2.

1. James Kennedy of Doonholm, Ayr, "Mondello" (27,193).
2. A. D. MacRae, Ruthven, Kingussie, "Earl Echo of Ballindalloch" (26,706).
3. J. E. Kerr of Harviestoun, Dollar, "Evansville" (26,861).
4. John Macpherson, Mulben, Keith, "Eclipses of Ballindalloch" (26,733).
- V. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Proud Prince of Dalmeny" (27,424).
- H. John M'G. Petrie, Glenlogie Forbes, Alford, Aberdeenshire, "Metaphor" (27,161).
- C. Garden A. Duff of Hatton Castle, Turriff, "Edmund of Aberlour" (26,744).

*Best Cow of any age in Class 10*—Ballindalloch Challenge Cup, value £50, given by the late Mr C. Macpherson Grant of Drumduan.

James Kennedy of Doonholm, Ayr, "Euroto" (39,206).

*Breeder of the Winner of the Ballindalloch Challenge Cup*—The Silver Medal.

James Kennedy of Doonholm, Ayr.

*Best Breeding Female Animal of the Breed in the Showyard*—Champion Gold Medal, given by the Polled Cattle Society.

James Kennedy of Doonholm, Ayr, "Euroto" (39,206).

**CLASS 10. COW, of any age, in Milk.**—Premiums, £12, £8, £4, and £2.

1. James Kennedy, of Doonholm, Ayr, "Euroto" (39,206).
2. The Countess-Dowager of Seafield, Home Farm, Cullen House, Cullen, "Eciton Erica" (38,061).
3. David Arnot, Edzell Mains, Edzell, "Violet 3rd of Congash" (39,314).
4. Geo. Smith Grant, Auchorachan, Glenlivet, "Legend E 2nd" (39,043).
- V. James Whyte, Hayston, Glamis, "Bashful Bet" (39,794).
- H. Sir John Macpherson-Grant, Bart., Ballindalloch Castle, Ballindalloch, "Early Echo" (30,131).
- C. T. H. Bainbridge, Eshott Hall, Felton, Northumberland, "Mistress Nellie" (32,975).
- C. James Beddie, Banks, Strichen, "Craig XI." (36,823).

**CLASS 11. HEIFER, calved on or after 1st December 1905.**—Premiums, £10, £5, £3, and £2.

1. James Kennedy of Doonholm, Ayr, "Ellen Terry" (40,745).
2. James Beddie, Banks, Strichen, "Gammer 3rd" (40,038).
3. James Whyte, Hayston, Glamis, "Beaming Bet" (41,421).
4. Charles Penny, Skillymarno, Strichen, "Pride of Glenlyon" (40,270).
- V. James Beddie, Banks, Strichen, "Kernel of Banks" (40,040).
- H. Sir George William Abercromby, Bart., Forglan House, Turriff, "Her Majesty of Forglan" (39,900).
- C. R. Wylie Hill of Balthayock, Perth, "Mariana of Balthayock" (40,680).
- C. J. E. Kerr of Harviestoun, Dollar, "Ethiopia" (40,752).

**CLASS 12. HEIFER, calved on or after 1st December 1906.**—Premiums, £10, £5, £3, and £2.

1. James Kennedy of Doonholm, Ayr, "Ermosa" (42,354).
2. W. Shaw Adamson of Careston, Careston Castle, Brechin, "Hersilia of Careston" (41,525).
3. Sir John Macpherson-Grant, Bart., Ballindalloch Castle, Ballindalloch, "Pride of Bundearg" (42,194).
4. Geo. Smith Grant, Auchorachan, Glenlivet, "Entwine of Auchorachan" (42,199).
- V. R. Wylie Hill of Balthayock, Perth, "Elvina of Gallovie" (42,166).
- H. His Majesty the King, Abergeldie Mains, Ballater, N.B., "Prideawing" (41,503).
- C. His Majesty the King, Abergeldie Mains, Ballater, N.B., "Gwyddie" (41,502).
- C. T. H. Bainbridge, Eshott Hall, Felton, Northumberland, "Eureta."
- C. James Beddie, Banks, Strichen, "Keilah of Banks" (41,626).
- C. James Kennedy of Doonholm, Ayr, "Pride of Doonholm" (42,357).

## GALLOWAY.

*PRESIDENT'S CHAMPION MEDAL for best Galloway.*

Francis N. M. Gourlay, Broomfield, Montaive, Dumfriesshire, "Keystone" (9689).

*Breeder of best Bull of any age in Classes 13, 14, and 15*—The Silver Medal.

Thomas Biggar & Sons, Chapelton, Dalbeattie, "Keystone" (9689).

**CLASS 13. BULL**, calved before 1st December 1905.—  
Premiums, £15, £10, £5, and £3.

1. Arthur H. Fox-Brockbank, The Croft, Kirksanton, Cumberland, "Gladiator of Barsalloch" (7934).
2. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Idaho" (9140).
3. The Duke of Buccleuch and Queensberry, K.G., K.T., Drumlanrig Castle, Thornhill, Dumfriesshire, "Romulus of Drumlanrig" (9421).
4. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Javelin" (9441).
- V. James Irving, Broomhouses, Lockerbie, "Class of Stepford" (9479).

**CLASS 14. BULL**, calved on or after 1st December 1905.—  
Premiums, £15, £10, £5, and £3.

1. Francis N. M. Gourlay, Broomfield, Moniaive, Dumfriesshire, "Keystone" (9689).
2. T. & R. Graham, Marchfield and Chapel Logan, Dumfries, "Marchfield Despised" (10,149).
3. Robert Graham, Auchengassel, Twynholm, "Standard of Boreland" (10,168).

**CLASS 15. BULL**, calved on or after 1st December 1906.—  
Premiums, £12, £8, £4, and £2.

1. Robert Graham, Auchengassel, Twynholm, "War Boy" (10,176).
2. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Sweepstakes" (10,001).
3. Andrew Montgomery, Netherhall, Castle-Douglas, "Baron" (10,033).
4. T. & R. Graham, Marchfield and Chapel Logan, Dumfries, "Bruce of Thorniehill" (10,035).
- V. The Duke of Buccleuch and Queensberry, K.G., K.T., Drumlanrig Castle, Thornhill, Dumfriesshire, "Border King of Drumlanrig" (9925).

**CLASS 16. COW**, of any age, in Milk.—Premiums, £12, £8, £4, and £2.

1. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Flora Macdonald" (16,422).
2. John Cunningham, Tarbreoch, Dalbeattie, "Maggie Lauder 5th of Tarbreoch" (18,829).
3. John Cunningham, Tarbreoch, Dalbeattie, "Doris of Kilquhanity" (16,912).
4. Sir Robert W. Buchanan-Jardine, Bart. of Castlemilk, Lockerbie, "Black Belle of Castlemilk" (17,912).

**CLASS 17. HEIFER**, calved on or after 1st December 1905.—  
Premiums, £10, £5, £3, and £2.

1. Robert Graham, Auchengassel, Twynholm, "Isa Violet" (19,175).
2. John Cunningham, Tarbreoch, Dalbeattie, "Miss Sally 8th of Tarbreoch" (19,182).
3. Robert Graham, Auchengassel, Twynholm, "Ida Betty" (19,173).
4. The Duke of Buccleuch and Queensberry, K.G., K.T., Drumlanrig Castle, Thornhill, Dumfriesshire, "Olivia 2nd of Drumlanrig" (19,074).
- V. John Cunningham, Tarbreoch, Dalbeattie, "Maggie Lauder 6th of Tarbreoch" (19,183).
- H. The Duke of Buccleuch and Queensberry, K.G., K.T., Drumlanrig Castle, Thornhill, Dumfriesshire, "Fairy Queen 8th of Drumlanrig" (19,073).

**CLASS 18. HEIFER**, calved on or after 1st December 1906.—  
Premiums, £10, £5, £3, and £2.

1. Francis N. M. Gourlay, Broomfield, Moniaive, Dumfriesshire, "Favourite of Craigneston" (19,625).
2. John Cunningham, Tarbreoch, Dalbeattie, "Maggie Lauder 7th of Tarbreoch" (19,512).
3. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Country Girl" (19,465).
4. Sir Robert W. Buchanan-Jardine, Bart. of Castlemilk, Lockerbie, "Daffodil III. of Castlemilk" (19,456).
- V. Francis N. M. Gourlay, Broomfield, Moniaive, Dumfriesshire, "Flavia of Craigneston" (19,628).

## HIGHLAND.

*PRESIDENT'S CHAMPION MEDAL for best Highland Animal.*

Donald A. Stewart, Ensay, Portree, "Laoghag Iseabel" (7396).

*Breeder of best Bull of any age in Classes 19, 20, and 21—The Silver Medal.*

The Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Morair Bhealach."

## CLASS 19. BULL, calved before 1906.—Premiums, £15, £10, £5, and £3.

1. Colonel Malcolm of Poltalloch, C.B., Poltalloch, Lochgilphead, "Uilleam of Farr" (1747).
2. Ian Bullough, Meggernie Castle, Aberfeldy, "Albannach" (2092).
3. Donald A. Stewart, Ensay, Portree, "An-t-Oighie."
4. Archibald Turner, Kilchamaig, Whitehouse, Argyllshire, "Talisman" (2076).

## CLASS 20. BULL, calved in 1906.—Premiums, £15, £10, £5, and £3.

1. Sir Donald Currie, G.C.M.G., Balnacraig Farm, Fortingall, "Morair Bhealach."
2. William Sopper of Dunmaglass, Daviot, "Agamemnon."
3. Thomas A. Nelson, Achnacloich, Connel, Argyll, "An Seanalair Ruadh."
4. Donald A. Stewart, Ensay, Portree, "An-t-albanach Buidhe."

## CLASS 21. BULL, calved in 1907.—Premiums, £12, £8, £4, and £2.

1. Ian Bullough, Meggernie Castle, Aberfeldy, "Cheard Buidhe."
2. The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Gaisgeach Riabhach of Atholl."
3. William Dalziel Mackenzie of Farr, Daviot, "Emblem of Farr."
4. William Sopper of Dunmaglass, Daviot, "Adonis."
- V. Colonel Malcolm of Poltalloch, C.B., Poltalloch, Lochgilphead, "Iain a Ghlinne-so."
- H. The Earl of Southesk, Kinnaird Castle, Brechin, "Calum Riabhach II. of Southesk."
- C. Ian Bullough, Meggernie Castle, Aberfeldy, "Cheard Ruadh."

## CLASS 22. COW, of any age, in Milk.—Premiums, £12, £8, £4, and £2.

1. Donald A. Stewart, Ensay, Portree, "Laoghag Iseabel" (7396).
2. The Countess-Dowager of Seafield, Castle Grant, Grantown, Strathspey, "Empress Victoria" (6513).
3. W. Dalziel Mackenzie of Farr, Daviot, "Flora Buidhe of Farr" (5721).
4. Colonel Malcolm of Poltalloch, C.B., Poltalloch, Lochgilphead, "Ribhinn Ruadh" (6402).
- V. William Sopper of Dunmaglass, Daviot, "Madam Luna" (5289).
- H. W. Dalziel Mackenzie of Farr, Daviot, "Banag of Farr" (6295).

## CLASS 23. HEIFER, calved in 1905.—Premiums, £10, £5, £3, and £2.

1. The Countess-Dowager of Seafield, Castle Grant, Grantown, Strathspey, "Empress Almira" (6933).
2. Donald A. Stewart, Ensay, Portree, "Shellay."
3. The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Donnag Riabhach 4th of Atholl."
4. The Earl of Southesk, Kinnaird Castle, Brechin, "Dilla" (6997).
- V. The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Bean Bhuidhe 5th of Atholl."
- H. Gerard Craig Sellar, Ardtornish, Morvern, "Lady Laura 2nd of Ardtornish" (6941).
- C. Colonel Malcolm of Poltalloch, C.B., Poltalloch, Lochgilphead, "Ribhinn Bhuidhe I. of Poltalloch."

**CLASS 24. HEIFER, calved in 1906.—Premiums, £10, £5, £3, and £2.**

1. Gerard Craig Sellar, Ardtornish, Morvern, "Mairi Ruadh of Ardtornish."
2. The Earl of Southesk, Kinnaird Castle, Brechin, "Princess Caroline."
3. Donald A. Stewart, Ensay, Portree, "Shellay."
4. William Sopper of Dunnaglass, Daviot, "Diana."
- V. The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Bean Bhan 1st of Atholl."
- H. The Countess-Dowager of Seafield, Castle Grant, Grantown, Strathspey, "Fanny of Castle Grant."
- C. The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Beauty 5th of Atholl."

**AYRSHIRE.**

**PRESIDENT'S CHAMPION MEDAL for best Ayrshire.**

Lieut. - Colonel Fergusson - Buchanan of Auchentorlie, Bowling, "Auchentorlie Bloomer" (16,644).

*Breeder of best Bull of any age in Classes 25, 26, and 27—The Silver Medal.*

Robert Osborne, Morton Mains, Thornhill, "Morton Mains Valmont."

*Special Prize of £10 for the best Animal of the Ayrshire breed, entered with a number in the Ayrshire Cattle Herd-Book, given by the Ayrshire Cattle Herd-Book Society.*

Lieut. - Colonel Fergusson - Buchanan of Auchentorlie, Bowling, "Auchentorlie Bloomer" (16,644).

**CLASS 25. BULL, calved before 1906.—Premiums, £12, £8, and £4.**

1. Robert Osborne, Morton Mains, Thornhill, "Morton Mains Epicarmus" (5793).
2. Homer Young, Redhills, Collin, Dumfries, "Everlasting" (6169).

**CLASS 26. BULL, calved in 1906.—Premiums, £10, £7, and £3.**

1. D. & H. Wilson, Auchencloigh, Ochiltree, "Baron's Best" (6803).
2. Andrew Mitchell, Barcheskie, Kirkcudbright, "Arness Bibby" (6498).
3. Lieut. - Colonel Fergusson - Buchanan of Auchentorlie, Bowling, "Auchentorlie R.S.F." (6374).
- V. Andrew Mitchell, Barcheskie, Kirkcudbright, "Monte Cristo" (6795).

**CLASS 27. BULL, calved in 1907.—Premiums, £8, £5, and £3.**

1. Robert Osborne, Morton Mains, Thornhill, "Morton Mains Valmont."
2. Thomas Gibson, Auchencrief, Dumfries, "Centurion."
3. Robert Cunningham, Ardnass, Fenwick, Kilmarnock, "White Prince."
- II. Michael Logan, Bargaenoch, Drongan, "Bonnie Scotland" (7270).

**CLASS 28. COW, calved before 1905, in Milk.—Premiums, £12, £8, and £4.**

1. Alex. Cross of Knockdon, Maybole, "Lady Gaiety" (17,313).
2. A. W. & J. Kerr, Old Graitney, Gretna, Carlisle, "Old Graitney Fairy Like" (17,604).
3. A. W. & J. Kerr, Old Graitney, Gretna, Carlisle, "Old Graitney Soncie 8th" (19,545).

**CLASS 29. COW, in Milk, calved after 1st January 1905.—Premiums, £10, £7, and £3.**

1. Lieut. - Colonel Fergusson - Buchanan of Auchentorlie, Bowling, "Auchentorlie Bella" (18,671).
2. A. W. & J. Kerr, Old Graitney, Gretna, Carlisle, "Old Graitney Wee Kate 2nd" (21,008).

CLASS 30. COW of any age, in Calf, or HEIFER calved in 1905, in Calf and due to calve within nine months after the Show.—Premiums, £10, £7, and £3.

1. Lieut. - Colonel Fergusson - Buchanan of Auchentorlie, Bowling, "Auchentorlie Bloomer" (16,644).
2. Charles Douglas of Auchlochan, Lesmahagow, "Auchlochan Rosette" (21,547).
3. A. W. & J. Kerr, Old Graitney, Greta, Carlisle, "Old Graitney Fair Helen" (18,248).

CLASS 31. HEIFER, calved in 1906.—Premiums, £10, £5, and £3.

1. Robert Osborne, Morton Mains, Thornhill, "Morton Mains Phyllida" (20,838).
2. Robert Osborne, Morton Mains, Thornhill, "Morton Mains Kymaline" (20,836).
3. Robert Osborne, Morton Mains, Thornhill, "Morton Mains Chlorissa" (20,882).

CLASS 32. HEIFER, calved in 1907.—Premiums, £8, £5, and £3.

1. Michael Logan, Bargaenoch, Drongan, "Lorna Doone" (22,533).
2. Andrew Mitchell, Barcheskie, Kirkcudbright, "Sybil."
3. Michael Logan, Bargaenoch, Drongan, "Marie Corelli" (22,534).
- H. Robert Osborne, Morton Mains, Thornhill, "Morton Mains Nemourna."

### FAT CATTLE.

#### *PRESIDENT'S CHAMPION MEDAL for best Fat Animal.*

The Countess-Dowager of Seafield, Home Farm, Cullen House, Cullen (Aberdeen Angus), "Her Majesty 5th of Cullen" (41,169).

CLASS 33. OX, any pure Breed or Cross, calved after 1st December 1905.—Premiums, £5 and £2.

1. The Countess-Dowager of Seafield, Home Farm, Cullen House, Cullen (Aberdeen Angus), "Beef Steak."
2. D. Arnot, Edzell Mains, Edzell (Aberdeen-Angus), "Benjamin."
- V. D. Arnot, Edzell Mains, Edzell (Cross), "Sam."
- H. Sir John R. Gladstone, Bart., Fasque, Laurencekirk (Cross).
- C. Alexander Rhind, Muirton of Kinloss, Forbes (Aberdeen - Angus Cross), "Grange."
- C. John & A. G. Ross, Millcraig, Ainess (Shorthorn).

CLASS 34. OX, any pure Breed or Cross, calved after 1st December 1906.—Premiums, £5 and £2.

1. John & A. G. Ross, Millcraig, Ainess (Shorthorn).
2. Thos. Gordon Duff, Home Farm, Drummur, Keith (Cross), "Davie."
- V. The Countess-Dowager of Seafield, Home Farm, Cullen House, Cullen (Aberdeen-Angus), "Roast Beef of Cullen."
- II. The Countess-Dowager of Seafield, Home Farm, Cullen House, Cullen (Cross), "Scotch Grey of Cullen."
- C. D. Arnot, Edzell Mains, Edzell (Cross).
- C. Alexander Rhind, Muirton of Kinloss, Forbes (Shorthorn Cross), "Kilcoy."
- C. The Duke of Richmond and Gordon, K.G., Gordon Castle, Fochabers, N.B. (Cross), "Ardoch."

CLASS 35. HEIFER, any pure Breed or Cross, calved after 1st December 1905.—Premiums, £5 and £2.

1. The Countess-Dowager of Seafield, Home Farm, Cullen House, Cullen (Aberdeen-Angus), "Her Majesty 5th of Cullen" (41,169).
2. Sir John R. Gladstone, Bart., Fasque, Laurencekirk (Aberdeen-Angus), "Myrtle 15th of Fasque" (40,505).
- V. Jas. McWilliam, Garbity, Orton Station (Shorthorn), "Daisy 5th."
- H. Sir John Macpherson-Grant, Bart., Ballindalloch Castle, Ballindalloch (Aberdeen-Angus), "Romanga" (40,562).
- C. Alex. Spence, Forbes Arms Hotel, Alford, Aberdeenshire (Aberdeen-Angus), "Primrose."

CLASS 36. HEIFER, any pure Breed or Cross, calved after 1st December 1906.—  
Premiums, £5 and £2.

1. George Bruce, Tochineal, Cullen (Cross).
2. T. H. Bainbridge, Eshott Hall, Felton, Northumberland (Aberdeen - Angus),  
"Eolienne" (82).
- V. D. Arnot, Edzell Mains, Edzell (Cross).
- H. Thos. Gordon Duff, Home Farm, Drummur, Keith (Cross), "Cathie."

### EXTRA STOCK.

The following was Very Highly Commended, and a Medium Silver Medal awarded—  
Sir Reginald A. E. Cathcart, Bart., Cluny Castle, Aberdeen (West Highland steer),  
"Ian Riabhach og."

## HORSES

### FOR AGRICULTURAL PURPOSES.

#### DRAUGHT STALLIONS.

*PRESIDENT'S CHAMPION MEDAL for best Clydesdale Stallion or Colt.*

- A. & W. Montgomery, Netherhall and Banks, Kirkcudbright (one-year-old Entire Colt).

*Breeder of best Male Animal of any age in Classes 37 to 40—The Silver Medal.*

- G. & J. Cocker, Hill of Petty, Fyvie.

CLASS 37. STALLION, foaled before 1905.—Premiums, £20, £15, £10, and £4.

1. William Dunlop, Dunure Mains, Ayr, "Baron of Buchlyvie" (11,263).
2. James Kilpatrick, Craigie Mains, Kilmarnock, "Perfect Motion" (13,123).
3. Matthew Marshall, Bridgebank, Stranraer, "Memento" (13,100).
4. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Baron Beaulieu"  
(11,267).
- V. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Gartly Pride"  
(12,997).
- H. D. Riddell, Blackhall, Paisley, "King's Champion" (14,184).
- C. James Kilpatrick, Craigie Mains, Kilmarnock, "Dunedin" (12,951).

CLASS 38. ENTIRE COLT, foaled in 1905.—Premiums, £20, £15, £10, and £4.

1. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Gartly Bonus"  
(13,491).
2. Walter S. Park, Hatton, Bishopton, "Chattan Again."
3. T. Purdie-Somerville, Sandilands, Lanark, "Scotland's Choice" (13,732).
4. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Baron Laird"  
(13,336).
- V. William Dunlop, Dunure Mains, Ayr, "Dunure Foreman" (13,450).
- H. James Kilpatrick, Craigie Mains, Kilmarnock, "Royal Gretna."
- C. A. M'Robbie, Sunnyside, Aberdeen, "Baron Forbes" (13,327).

CLASS 39. ENTIRE COLT, foaled in 1906.—Premiums, £20, £12, £8, and £4.

1. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Baron Hopetoun"  
(13,989).
2. T. Purdie-Somerville, Sandilands, Lanark, "Scotland Yet."
3. Walter S. Park, Hatton, Bishopton, "Valdor."
4. James Kilpatrick, Craigie Mains, Kilmarnock, "Auchincruive."
- V. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Privy Seal"  
(14,823).
- H. William Dunlop, Dunure Mains, Ayr, "Dunure Nikko" (14,102).
- C. James Kilpatrick, Craigie Mains, Kilmarnock, "Goldrock" (14,150).

CLASS 40. ENTIRE COLT, foaled in 1907.—Premiums, £15, £10, £8, and £4.

1. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
2. George Alston, London Hill, Darvell, "Black Douglas."
3. William Taylor, Park Mains, Renfrew.
4. William Clark, Netherlea, Cathcart, "Abbey Gale."
5. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
6. William Dunlop, Dunure Mains, Ayr, "Dunure Wallace."
7. John M'Nee, Afton House, Crief.

#### DRAUGHT GELDINGS.

*PRESIDENT'S CHAMPION MEDAL for best Draught Gelding.*

William Clark, Netherlea, Cathcart, "Tom."

CLASS 41. DRAUGHT GELDING, foaled before 1905.—  
Premiums, £10, £5, and £3.

1. William Clark, Netherlea, Cathcart, "Tom."
2. H. & A. Milne, Fetterletter, Fyvie, "Victor."
3. Peter Beaton, 12 West Burn Square, Greenock, "Dandy."
4. J. & W. Meiklem, Begg, Kirkcaldy, "Bob."
5. William Clark, Wester Bogie, Kirkcaldy, "Harry Lauder."

CLASS 42. DRAUGHT GELDING, foaled in 1905.—Premiums, £6, £4, and £3.

1. Alexander Clark, Newton, Markinch, "Newton Don."
2. William Clark, Netherlea, Cathcart, "Ned."
3. J. & W. Meiklem, Begg, Kirkcaldy, "Tom."

CLASS 43. DRAUGHT GELDING, foaled in 1906.—Premiums, £6, £4, and £3.

1. William Clark, Netherlea, Cathcart, "Jamie."
2. W. M. Ritchie, Balcairn, Old Meldrum, "Donal."
3. J. & W. Meiklem, Begg, Kirkcaldy, "Charlie."
4. David Allan, South Fod, Dunfermline.
5. Alexander Clark, Newton, Markinch, "Avoca."
6. Alexander Dingwall Fordyce, Brucklay, Castle Brucklay, "Aberdour Baron."

#### DRAUGHT MARES AND FILLIES.

*PRESIDENT'S CHAMPION MEDAL for best Clydesdale Mare or Filly.*

J. E. Kerr of Harviestoun, Dollar, "Nerissa."

*Best Clydesdale Mare or Filly registered in the Clydesdale Stud-Book—Cawdor Challenge Cup, value 50 guineas, given by the Clydesdale Horse Society.*

J. E. Kerr of Harviestoun, Dollar, "Nerissa."

Mr J. E. Kerr having won the Cup three times, it now becomes his own property.

*Breeder of Best Clydesdale Brood Mare—The Robert Murdoch Prize, value £10.*

The late Thomas Smith, Blacon Point, Chester, "Royal Ruby."

CLASS 44. MARE of any age, with Foal at foot.—  
Premiums, £20, £12, £7, and £4.

1. Stephen Mitchell of Boquhan, Kippen Station, "Royal Ruby."
2. Stephen Mitchell of Boquhan, Kippen Station, "Minnewawa."
3. John M'Nee, Afton House, Crief, "Countess of Afton."

**CLASS 45. YELD MARE**, foaled before 1905.—  
Premiums, £12, £9, £6, and £4.

1. J. E. Kerr of Harviestoun, Dollar, "Chester Princess" (16,371).
2. D. Y. Stewart, Carse of Trowan, Crieff, "Veronique" (19,758).
3. George Argo, Petty, Fyvie, "Royalette."
4. G. & J. Cocker, Hill of Petty, Fyvie, "Lady Ashvale" (19,285).
5. J. & J. Calder, Ledlanet Home Farm, Milnathort, "Favourite Queen."
6. H. B. Marshall of Rachan, Broughton, Peeblesshire, "Baron's Brilliant."

**CLASS 46. YELD MARE or FILLY**, foaled in 1905.—  
Premiums, £12, £9, £6, and £4.

1. J. E. Kerr of Harviestoun, Dollar, "Marilla."
2. William Neilson, Haining Valley, Linlithgow, "Daisy Primrose."
3. Seaham Harbour Stud, Ltd., The Dene, Seaham Harbour, "Just Katie."
4. John P. Sleight, St John's Wells, Fyvie, "Lucilla."
5. William Taylor, Park Mains, Renfrew.
6. John Weir, Townhead Farm, Lanark, "White Silk."
7. Alexander Simpson, Woodside, Portnockie, Banffshire, "Isabel."

**CLASS 47. FILLY**, foaled in 1906.—Premiums, £12, £9, £6, and £4.

1. J. E. Kerr of Harviestoun, Dollar, "Nerissa."
2. Henry B. Marshall of Rachan, Broughton, Peeblesshire, "Sarcelle."
3. Stephen Mitchell of Boquhan, Kippen Station, "Boquhan Lady Peggie."
4. W. M. Ritchie, Balcairn, Old Meldrum, "Harviestoun Baroness."
5. John M'Nee, Afton House, Crieff.
6. J. & J. Calder, Ledlanet Home Farm, Milnathort, "Maggie Dee."
7. George Bean, West Ballochry, Montrose, "Queen Marcellini."

**CLASS 48. FILLY**, foaled in 1907.—Premiums, £12, £9, £6, and £4.

1. J. E. Kerr of Harviestoun, Dollar, "Ferolith."
2. J. E. Kerr of Harviestoun, Dollar, "Meta."
3. John P. Sleight, St John's Wells, Fyvie, "Thelma II."
4. Wm. Dunlop, Dunure Mains, Ayr, "Dunure May."
5. D. Y. Stewart, Carse of Trowan, Crieff, "Roseen."
6. Stephen Mitchell of Boquhan, Kippen Station, "Boquhan Beatrice."
7. D. Y. Stewart, Carse of Trowan, Crieff, "Ellen."

**HUNTERS.**

**PRESIDENT'S CHAMPION MEDAL for best Hunter.**

Captain Clayhills Henderson, R.N., of Invergowrie, Dundee, Gelding, "Surprise."

*Best Hunter Filly in Classes 49, 50, and 51, registered or entered in the Hunter Stud-Book*—Gold Medal, value £10, 10s., given by the Hunter Improvement Society.

James Cairns, Abercrombie, St Monance, Filly, "Joyful" (3123).

**CLASS 49. COLT, GELDING, or FILLY**, foaled in 1907, the produce of thoroughbred Stallions, out of Mares of any breed.—Four Prizes—£10, £5, £2, and £1, given by Sir John Gilmour of Montrave, Bart.

1. James Cairns, Abercrombie, St Monance, Filly, "Joyful" (3123).
2. David Deuchar, Low Buston, Warkworth, Filly, "Coquet Girl."
3. Captain Clayhills Henderson, R.N., of Invergowrie, Dundee, Colt, "Boss."
4. J. A. Campbell, Craigie House, Ayr, Filly.

**CLASS 50. FILLY, MARE, or GELDING**, for field, foaled in 1906, *in hand*.—Premiums, £8, £5, and £3.

1. Captain Clayhills Henderson, R.N., of Invergowrie, Dundee, Gelding, "Surprise."
2. David Deuchar, Low Buston, Warkworth, Filly "Gay Girl II."
3. James Cairns, Abercrombie, St Monance, Gelding, "Red Eagle."
4. James Cairns, Abercrombie, St Monance, Filly, "Sylvia."
5. Captain Clayhills Henderson, R.N., of Invergowrie, Dundee, Gelding, "Beam."

CLASS 51. YELD MARE, FILLY, or GELDING, for field, foaled in 1905, *in hand*.—Premiums, £8, £5, and £3.

1. William Lee Carlyle, Templehill, Ecclefechan, Filly, "Peg the Rake."
2. James Cairns, Abercrombie, St Monance, Filly, "Miss Moubray" (8171).
3. Captain Clayhills Henderson, R.N., of Invergowrie, Dundee, Gelding, "Primrose."
- V. Alexander Berry, Haughmill, Windygates, Fife, Gelding, "Togo."

CLASS 52. HUNTER BROOD MARE, with Foal at foot.—Premiums, £15, £8, and £4, given by Captain Clayhills Henderson of Invergowrie, R.N.

1. Frederick Armstrong, M.R.C.V.S., L., George Hotel, Penrith, "Emma."
2. Captain Clayhills Henderson, R.N., of Invergowrie, Dundee, "Rosemary" (2498).
3. James Cairns, Abercrombie, St Monance, "Lady Moubray."
- V. J. P. Laurie, Shieldhill, Lochmaben, "Rose."

### EXTRA STOCK.

The following was Very Highly Commended, and a Medium Silver Medal awarded.

John Clark, Cairnaquheen Cottage, Mid Stocket Road, Aberdeen, Yorkshire Coaching Stallion, "Woodland King" (2446).

### HACKNEYS.

(ALL TO BE SHOWN IN HAND.)

#### PRESIDENT'S CHAMPION MEDAL for best Hackney.

John Smith, Adderley, Monifieth, Forfarshire, "Adderley" (10,054).

*Best Mare or Filly in Hackney or Pony Classes*—Champion Prize of £10, or a Gold Medal of the same value, at the option of the Exhibitor, given by the Hackney Horse Society.

A. M'Kerrow, Camphill, Bearsden, "Boquhan Sunflower" (16,468).

CLASS 53. BROOD MARE, 15 hands and upwards, with Foal at foot or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £10, £6, and £4.

1. A. M'Kerrow, Camphill, Bearsden, "Boquhan Sunflower," (16,468).
2. John W. Kynoch, Isla Bank, Keith, "Braco Bangle" (14,177).
3. William Wisely, Braeside, Mannofield, Aberdeen, "Moncreiffe Phoebe" (17,595).
- V. William Wisely, Braeside, Mannofield, Aberdeen, "Old Lace" (11,356).
- H. W. F. Maund, North Lodge, Balloch, Dumbartonshire, "Lady Rhodesia."

CLASS 54. BROOD MARE, under 15 hands, with Foal at foot or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £10, £6, and £4.

William Wisely, Braeside, Mannofield, Aberdeen, "Braeside Nutmeg" (18,051).

CLASS 55. YELD MARE or FILLY, foaled in 1905. Registered in the Hackney Stud-Book.—Premiums, £8, £5, and £3.

1. John W. Kynoch, Isla Bank, Keith, "Princess May of Isla Bank" (18,510).
2. George R. Watson, Parkhead Cross, Glasgow, "Flyde Carmania" (18,214).

CLASS 56. FILLY, foaled in 1906. Registered in the Hackney Stud-Book.—Premiums, £8, £5, and £3.

William Wisely, Braeside, Mannofield, Aberdeen, "Braeside Gladys" (18,939).

**CLASS 57. FILLY**, foaled in 1907, eligible for entry in the Hackney Stud-Book.—Premiums, £8, £5, and £3.

*Not Forward.*

**CLASS 58. STALLION**, foaled in or before 1905, over 15 hands. Registered in the Hackney Stud-Book.—Premiums, £10, £6, and £4.

1. Wm. Alexander, The Stud, Brentham Park, Stirling, "Brentham Pioneer" (9625).
2. William Wisely, Braeside, Mannofield, Aberdeen, "Braeside Freemaster" (9619).

**CLASS 59. STALLION**, foaled in or before 1905, over 14 and not over 15 hands. Registered in the Hackney Stud-Book.—Premiums, £10, £6, and £4.

1. Andrew Rowan, Blairingone, Dollar, "Devondale."
2. Thomas Steen, Ayrshire and Galloway Hotel, Ayr, "The Cingalee" (9465).

**CLASS 60. ENTIRE COLT**, foaled in 1906. Registered in the Hackney Stud-Book.—Premiums, £8, £5, and £3.

1. John Smith, Adderley, Monifieth, Forfarshire, "Adderley" (10,054).
2. Wm. M'Allister, The Inverness Hackney Stud, Inverness, "Abbreviator of Inverness" (10,047).
3. William Wisely, Braeside, Mannofield, Aberdeen, "Braeside Sportsman" (10,122).

**CLASS 61. ENTIRE COLT**, foaled in 1907, eligible for entry in the Hackney Stud-Book.—Premiums, £8, £5, and £3.

1. John W. Kynoch, Isla Bank, Keith, "Royal Standard of Isla Bank."
2. Seton M. Thomson, Preston House, Linlithgow, "Peerless."
3. William Wisely, Braeside, Mannofield, Aberdeen, "Braeside Baron."

## PONIES.

### *PRESIDENT'S CHAMPION MEDAL for best Pony.*

George M'Donald, Roedene, Larch Road, Dumbreck, Glasgow, Mare, "Belle of New York."

**CLASS 62. STALLION**, 3 years old and upwards, 14 hands and under, *in hand*.—Premiums, £5, £3, and £2.

1. Robert H. Clayton, Brandling Hackney Stud, Felling-on-Tyne, "Brandling Caesar."
2. Robert H. Clayton, Brandling Hackney Stud, Felling-on-Tyne, "Gunnergate Wonder."
3. John Simpson, 6 King Street, Aberdeen, "Annfield Squire."

**CLASS 63. YELD MARE, FILLY**, or **GELDING**, 3 years old and upwards, over 13 and not over 14 hands, *in saddle*.—Premiums, £5, £3, and £2.

1. George M'Donald, Roedene, Larch Road, Dumbreck, Glasgow, Mare, "Belle of New York."
2. John Simpson, 6 King Street, Aberdeen, Gelding, "Sir Donald."

**CLASS 64. YELD MARE, FILLY**, or **GELDING**, 3 years old and upwards, over 12 and not over 13 hands, *in saddle*.—Premiums, £5, £3, and £2.

1. William S. Miller, Glendermott, Craigmore, Bute, Gelding, "Dumbreck Surprise."
2. William Wisely, Braeside, Mannofield, Aberdeen, Gelding, "Bantam."
3. James Wilson, Cameron Street, Dunfermline, Mare, "Little Queen."
- V. John Simpson, 6 King Street, Aberdeen, Mare, "Whitegate Cracker" (16,339).
- H. J. E. Kerr of Harviestoun, Dollar, Mare, "Firefly" (19,149).

**CLASS 65. YELD MARE, FILLY, or GELDING, 3 years old and upwards, 12 hands and under, in hand.**—Premiums, £5, £3, and £2.

1. Robert H. Clayton, Brandling Hackney Stud, Felling-on-Tyne, Gelding, "Gunnergate Cavalier."
2. Seaham Harbour Stud, Ltd., The Dene, Seaham Harbour, Mare, "Birdie."

#### FARMER'S GENERAL PURPOSE COB.

*PRESIDENT'S MEDAL for best Cob in Class 66.*

*No Entry.*

**CLASS 66. GENERAL PURPOSE COB, GELDING, MARE, or FILLY, not eligible by pedigree for any of the other Classes, over 3 years old, 14.2 hands upwards, in saddle.**—Premiums, £5, £3, and £2.

*No Entry.*

#### HIGHLAND PONIES.

*PRESIDENT'S CHAMPION MEDAL for best Highland Pony.*

W. Dalziel Mackenzie of Farr, Daviot, "Braulin."

**CLASS 67. HIGHLAND PONY STALLION, 3 years old or upwards, not exceeding 14.2 hands, entered or accepted for entry in the Highland Section of the Polo Pony Stud-Book.**—Premiums, £10, £3, and £2.

1. Donald Stewart, Drumchorry, Pitlochry, "Glen."
2. Lord Middleton, Applecross, Ross-shire, "Torgarbh."
3. J. Cossar Ewart, Duddingston House, Mid-Lothian, "Braemore."
- V. J. H. Munro Mackenzie of Calgary, Isle of Mull, "Skerryvore."

**CLASS 68. HIGHLAND PONY ENTIRE COLT, foaled in 1906 or 1907.**—Premiums, £10, £3, and £2.

1. J. H. Munro Mackenzie of Calgary, Isle of Mull, "Hyskeer."
2. Donald Stewart, Drumchorry, Pitlochry, "Giullian Laoch."

**CLASS 69. HIGHLAND PONY MARE, 3 years old or upwards, not exceeding 14.2 hands, Yeld or with Foal at foot, entered or accepted for entry in the Highland Section of the Polo Pony Stud-Book.**—Premiums, £10, £3, and £2.

1. W. Dalziel Mackenzie of Farr, Daviot, "Braulin."
2. J. H. Munro Mackenzie of Calgary, Isle of Mull, "Gometra" (1686).
3. J. Douglas Fletcher of Rosehaugh, Avoch, N.B., "Lady Strathnairn."
- V. R. Hargreaves, Gaick Forest, Kingussie, N.B., "Snowdrop."

**CLASS 70. HIGHLAND PONY MARE, 13.2 hands and under.**—Three Prizes, £5, £3, and £2, per Committee of Highland Section of Polo Pony Society.

1. J. H. Munro Mackenzie of Calgary, Isle of Mull, "Blink Bonny."
2. J. Cossar Ewart, Duddingston House, Mid-Lothian, "Mona."

#### SHETLAND PONIES.

(ALL TO BE SHOWN IN HAND.)

*PRESIDENT'S CHAMPION MEDAL for best Shetland Pony.*

Charles Douglas of Auchlochan, Leamahagow, "Crown Prince" (342).

*Group of Shetland Ponies, consisting of one Stallion and two Mares, exhibited in the ordinary Classes, and entered or eligible for entry in the Shetland Pony Stud-Book—First Prize, Piece of Silver Plate, value £4; Second Prize, value £3; given by Mr Anderson Manson, Lerwick.*

1. William Mungall of Transy, Dunfermline.
2. R. W. R. Mackenzie, Earlsall, Leuchars.

*Best Shetland Pony Stallion exhibited in Ordinary Classes, entered or eligible for entry in the Shetland Pony Stud-Book*—Silver Medal, given by Mr Anderson Manson Lerwick.

Charles Douglas of Auchlochan, Lesmahagow, "Crown Prince" (342).

CLASS 71. STALLION, not exceeding 10½ hands, foaled before 1905.—  
Premiums, £5, £4, £3, and £2.

1. Charles Douglas of Auchlochan, Lesmahagow, "Crown Prince" (342).
2. William Mungall of Transy, Dunfermline, "Seaweed" (333).
3. R. W. R. Mackenzie, Earlsall, Leuchars, "Beasbrook of Earlsall."
4. R. W. R. Mackenzie, Earlsall, Leuchars, "Helmet of Earlsall."
- V. George A. Miller, Lawmuir, Methven, "Silver Gilt."
- H. Miss J. T. Irvine Fortescue, Kingcausie, Aberdeen, "Brigadier" (341).
- C. Colonel Smythe, Methven Castle, Perth, "Bravo."

EXTRA STOCK.

The following was Very Highly Commended, and a Medium Silver Medal awarded.

J. Douglas Fletcher of Rosehaugh, Avoch, N.B., "Merry Hero" (244).

CLASS 72. ENTIRE COLT, not exceeding 10½ hands, foaled in 1905 or 1906.—  
Premiums, £5, £4, £3, and £2.

1. Miss Nicol, Roscobie, Banchory, N.B. "Faffner."
2. William Mungall of Transy, Dunfermline, "Silverton of Transy."
3. R. W. R. Mackenzie, Earlsall, Leuchars, "Helot of Earlsall."
4. John Spratt, 108 High Street, Montrose, "Southesk."
- V. Anderson Manson, Veensgarth, Lerwick, "King Haakon."
- H. George A. Miller, Lawmuir, Methven, "Birkie."
- C. Charles Douglas of Auchlochan, Lesmahagow, "Excelsior."

*Best Shetland Pony Mare, exhibited in Ordinary Classes, entered or eligible for entry in the Shetland Pony Stud-Book*—Silver Medal, given by Mr Anderson Manson, Lerwick.

William Mungall of Transy, Dunfermline "Sovereign" (1730).

CLASS 73. MARE, not exceeding 10½ hands, with Foal at foot.—  
Premiums, £5, £4, £3, and £2.

1. R. W. R. Mackenzie, Earlsall, Leuchars, "Helen" (1228).
2. R. W. R. Mackenzie, Earlsall, Leuchars, "Southdown of Earlsall."
3. William Mungall of Transy, Dunfermline, "Danish Queen" (1424).
4. Miss Nicol, Roscobie, Banchory, "Froda" (1906).
- V. Colonel Smythe, Methven Castle, Perth, "Momento" (1514).
- H. William Mungall of Transy, Dunfermline, "Helen II." (1480).
- C. George A. Miller, Lawmuir, Methven, "Hermia" (2071).
- C. Major-General F. S. Russell, C.M.G., of Aden, Mintlaw Station, "Lorna."

CLASS 74. YELD MARE, not exceeding 10½ hands.—  
Premiums, £5, £4, £3, and £2.

1. William Mungall of Transy, Dunfermline, "Sovereign" (1730).
2. William Mungall of Transy, Dunfermline, "Lady Steynor."
3. Anderson Manson, Veensgarth, Lerwick, "Bronte II." (1755).
4. Charles Douglas of Auchlochan, Lesmahagow, "Inga" (1492).
- V. William Parkin-Moore, Whitehall, Mealagate, Cumberland, "Nectar."
- H. William Parkin-Moore, Whitehall, Mealagate, Cumberland, "Noreen" (2072).
- C. Anderson Manson, Veensgarth, Lerwick, "Nora."

CLASS 75. FILLY, not exceeding 10½ hands, foaled in 1905 or 1906.—  
Premiums, £6, £4, £3, and £2.

1. R. W. R. Mackenzie, Earlsball, Leuchars, "Lady Sophia."
2. Robert William Duff of Fetteresso Castle, Stonehaven, "Jewel of Fetteresso."
3. Robert William Duff of Fetteresso Castle, Stonehaven, "Hecuba."
4. William Mungall of Transy, Dunfermline, "Sheina."
- V. Miss Nicol, Roscobie, Banchory, "Fenella."
- H. Miss J. T. Irvine Fortescue, Kingcausie, Aberdeen, "Berthula."
- C. Anderson Manson, Veensgarth, Lerwick, "Emma of Maryfield."
- C. William Mungall of Transy, Dunfermline, "Naiad."
- C. Colonel Smythe, Methven Castle, Perth, "Lady Methven."

### DRIVING COMPETITIONS.

*PRESIDENT'S CHAMPION MEDAL for best animal in the Classes for Horses in Harness.*

William S. Miller, Glendermott, Craigmore, Bute, Mare, "Margaretta" (16,786).

CLASS 76. YELD MARE, FILLY, or GELDING, any age, in Harness, 15 hands and upwards, to be driven in the ring.—Premiums, £10, £5, and £3.

1. George Wolfe, Millburn, Bathgate, Mare, "Millburn Star."
2. J. E. Kerr of Harviestoun, Dollar, Mare, "Broxtou Geltlette" (16,494).
3. W. G. Dick, of Messrs Macrae & Dick, Inverness, Gelding, "Merry Denmark" (7554).
- V. James Wilson, Cameron Street, Dunfermline, Gelding, "Fascinator."
- H. William Wisely, Braeside, Mannofield, Aberdeen, Gelding, "Faustus."

*Special Prize for best Pony in Class 77 under 13 hands—£5.*

James Wilson, Cameron Street, Dunfermline, Mare, "Little Queen."

CLASS 77. YELD MARE, FILLY, or GELDING, any age, in Harness, under 15 hands, to be driven in the ring.—Premiums, £10, £5, and £3.

1. William S. Miller, Glendermott, Craigmore, Bute, Mare, "Margaretta" (16,786).
2. J. W. Mackie Adamson, Duncrevie, Glenfarg, Mare, "Radium" (16,878).
3. William Wisely, Braeside, Mannofield, Aberdeen, Gelding, "What Ho."
- V. Alexander Craig, 53 Schoolhill, Aberdeen, Gelding, "Chatelard."
- H. Geo. Johnston, jun., Craig Park, Airdrie, Gelding, "Sir Robert."
- C. William Trail, Riding Academy, Queen's Cross, Aberdeen, Gelding, "Leader of Fashion."

### JUMPING COMPETITIONS

*Wednesday, 22nd July.*

CLASS 1. HORSE or PONY, any height.—Premiums, £20, £15, £10, £5, and £3.

1. Simon Andrews & Sons, Cardonald Grain Mills, Paisley, Gelding, "Ping Pong."
2. E. Bradley, Newton, Great Ayton, Yorkshire, Gelding, "Piper."
3. F. V. Grange, Oak House, Farndon, Cheshire, Gelding, "Rufus."
4. James Nodwell, Whitesands Horse Repository, Dumfries, Gelding, "High Life."
5. D. Courage, Royal Oak Bar, Marischal Street, Aberdeen, Gelding, "Field-Marshal."

*Thursday, 23rd July.*

**CLASS 2. HORSE or PONY**, any height, Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in Class 1.—Premiums, £10, £8, £5, £3, and £2.

1. Simon Andrews & Sons, Cardonald Grain Mills, Paisley, Gelding, "Ping Pong."
2. F. V. Grange, Oak House, Farndon, Cheshire, Gelding, "Rufus."
3. James Nodwell, Whitesands Horse Repository, Dumfries, Gelding, "High Life."
4. E. Bradley, Newton, Great Ayton, Yorkshire, Gelding, "Piper."
5. E. G. Easterby, Mount Pleasant, Escrick, Yorkshire, Gelding, "Kangaroo."

*Friday, 24th July.*

**CLASS 3. HORSE or PONY**, any height, Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in either of Classes 1 or 2—4 inches extra for the winner of the two first prizes in Classes 1 and 2.—Premiums, £10, £8, £5, £3, and £2.

1. F. V. Grange, Oak House, Farndon, Cheshire, Gelding, "Rufus."
2. Archibald Brown, Auchenhearth, Hamilton, Gelding, "Prince."
3. James Nodwell, Whitesands Horse Repository, Dumfries, Gelding, "High Life."
4. E. Bradley, Newton, Great Ayton, Yorkshire, Gelding, "Piper."
5. D. Courage, Royal Oak Bar, Marischal Street, Aberdeen, Gelding, "Field-Marshal."

*Champion Prize for most points in Prizes with one or more Horses in above Classes—*  
First Prize to count five points; Second prize, four points; Third Prize, three points; Fourth Prize, two points; and Fifth Prize, one point—the money to be evenly divided in the event of a tie—£10.

F. V. Grange, Oak House, Farndon, Cheshire.

*Wednesday Evening, 22nd July.*

**CLASS 4. HORSE or PONY**, any height.—Premiums, £8, £4, £2, and £1.

- |                   |   |  |   |        |
|-------------------|---|--|---|--------|
| Tie,<br>1. and 2. | { | F. V. Grange, Oak House, Farndon, Cheshire, Gelding, "Rufus."<br>James Nodwell, Whitesands Horse Repository, Dumfries, Gelding, "High Life." | } | equal. |
| Tie,<br>3. and 4. | { | Simon Andrews & Sons, Cardonald Grain Mills, Paisley, Gelding, "Ping Pong."<br>E. Bradley, Newton, Great Ayton, Yorkshire, Gelding, "Piper." | } | equal. |

*Thursday Evening, 23rd July.*

**CLASS 5. HORSE or PONY**, any height.—Premiums, £8, £4, £2, and £1.

1. F. V. Grange, Oak House, Farndon, Cheshire, Gelding, "Rufus."
2. E. Bradley, Newton, Great Ayton, Yorkshire, Gelding, "Piper."
3. James Nodwell, Whitesands Horse Repository, Dumfries, Gelding, "High Life."
4. Simon Andrews & Sons, Cardonald Grain Mills, Paisley, Gelding, "Ping Pong."

**SHEEP**

**BLACKFACE.**

*PRESIDENT'S CHAMPION MEDAL for best pen of Blackface Sheep.*

James Clark, Crossflatt, Muirkirk.

*The Sinclair Scott Challenge Trophy, value 100 guineas, for a Group of Sheep consisting of one Aged Ram, one Shearling Ram, one Ewe and Lamb, the Lamb to be the produce of the Ewe exhibited, and may be either a Tup or Ewe Lamb, and to be judged as part of the Group, and one Gimmer—All to be bred by and the property of the exhibitor, or bred on the farm now in his possession and the property of exhibitor, and shown in the ordinary classes; the Trophy to become the property of the exhibitor winning it three times with different sheep; Lambs, Shearling Rams, and Gimmers being eligible to compete again. Given by the late Mr R. Sinclair Scott of Burnside.*

*A Silver Medal, commemorative of the event, will be presented by the Society to the winner on each occasion.*

Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.

Messrs Cadzow Brothers having won the Cup three times, it now becomes their own property.

*A piece of Plate, value not less than £10, for the best six Shearling or Two-Shear Blackface Tups, entered in the ordinary classes, bred and reared by exhibitor, and never sold or out of his possession.*—Given by Mr C. Howatson of Glenbuck.

M. G. Hamilton, Woolfords, Cobbinshaw.

**CLASS 78. TUP, above one Shear.**—Premiums, £12, £8, £4, and £2.

1. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
2. Robert Buchanan, Blairquhosh, Blane field.
3. M. G. Hamilton, Woolfords, Cobbinshaw.
4. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
- V. John Robson, Mayshiel, Duns.
- H. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
- C. Charles Howatson of Glenbuck.

**CLASS 79. SHEARLING TUP.**—Premiums, £12, £8, £4, and £2.

1. M. G. Hamilton, Woolfords, Cobbinshaw.
2. M. G. Hamilton, Woolfords, Cobbinshaw.
3. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
4. James Clark, Crossflatt, Muirkirk.
- V. M. G. Hamilton, Woolfords, Cobbinshaw.
- H. Charles Howatson of Glenbuck.
- C. Robert Buchanan, Blairquhosh, Blane field.
- C. M. G. Hamilton, Woolfords, Cobbinshaw.

**CLASS 80. EWE, above one Shear, with her Lamb at foot.**—  
Premiums, £10, £5, and £2.

1. James Clark, Crossflatt, Muirkirk.
2. James Clark, Crossflatt, Muirkirk.
3. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
- V. Charles Howatson of Glenbuck.
- H. Mrs Turnbull, Smithston, Gartly.
- C. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
- C. James Clark, Crossflatt, Muirkirk.

**CLASS 81. SHEARLING EWE or GIMMER.**—Premiums, £10, £5, and £2.

1. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
2. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
3. Cadzow Brothers, Borland and Stonehill, Dunsyre, Carstairs Junction.
- V. James Clark, Crossflatt, Muirkirk.
- H. Charles Howatson of Glenbuck.
- C. William Cunningham, Auchtenny, Forgandenny.
- C. William Cunningham, Auchtenny, Forgandenny.

**CHEVIOT.**

*PRESIDENT'S CHAMPION MEDAL for best Pen of Cheviot Sheep.*

J. R. C. Smith, Mowhaugh, Yetholm, "Lord Cromer."

**CLASS 82. TUP, above one Shear.**—Premiums, £12, £8, £4, and £2.

1. J. R. C. Smith, Mowhaugh, Yetholm, "Lord Cromer."
2. John Elliot, Hindhope, Jedburgh.
3. A. & James K. Smith, Leaston, Upper Keith.
4. Jacob Robson, Byrness, Otterburn, Northumberland.

**CLASS 83. SHEARLING TUP.**—Premiums, £12, £8, £4, and £2.

1. John Elliot, Hindhope, Jedburgh.
2. J. R. C. Smith, Mowhaugh, Yetholm.
3. John Elliot, Hindhope, Jedburgh.
4. John Elliot, Hindhope, Jedburgh.

**CLASS 84. EWE**, above one Shear, with her Lamb at foot.—  
Premiums, £10, £5, and £2.

1. J. R. C. Smith, Mowhaugh, Yetholm.
2. A. & James K. Smith, Leaston, Upper Keith.
3. John Robson, Millknowe, Duns.
- C. Jacob Robson, Byrness, Otterburn, Northumberland.

**CLASS 85. SHEARLING EWE or GIMMER**.—Premiums, £10, £5, and £2.

1. Jacob Robson, Byrness, Otterburn, Northumberland.
2. John Elliot, Hindhope, Jedburgh.
3. Jacob Robson, Byrness, Otterburn, Northumberland.
- H. A. & James K. Smith, Leaston, Upper Keith.

### BORDER LEICESTER.

*PRESIDENT'S CHAMPION MEDAL for best Pen of Border Leicesters.*

Archibald Cameron & Sons, Westside Farm, Brechin (Shearling Ewe or Gimmer).

*Tweeddale Gold Medal for best Border Leicester Tup.*

The Right Hon. A. J. Balfour, M.P., Whittingehame, Prestonkirk, "Leaston Surprise" (1836).

*Prize of £10 for best Pen of Border Leicester Sheep, drawn from the Ordinary Classes, registered or eligible for registration in the Border Leicester Flock-Book,—given by the Society of Border Leicester Sheep-Breeders.*

Archibald Cameron & Sons, Westside Farm, Brechin.

**CLASS 86. TUP**, above one Shear.—Premiums, £12, £8, £4, and £2.

1. The Right Hon. A. J. Balfour, M.P., Whittingehame, Prestonkirk, "Leaston Surprise" (1836).
2. A. & James K. Smith, Leaston, Upper Keith, "Longcroft Model."
3. A. & James K. Smith, Leaston, Upper Keith, "Leaston Sir James."
4. George & John Fairbairn, Middle Quarter, Carluke.
- V. James Campbell & Sons, Illieston, Mid-Calder.
- H. D. Y. Stewart, Carse of Trowan, Crieff.
- C. The Right Hon. A. J. Balfour, M.P., Whittingehame, Prestonkirk, "Whittingehame Chief" (2193).

**CLASS 87. SHEARLING TUP**.—Premiums, £12, £8, £4, and £2.

1. Archibald Cameron & Sons, Westside Farm, Brechin.
2. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
3. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
4. Robert Forsyth, New Smalholm, Kelso.
- V. Archibald Cameron & Sons, Westside Farm, Brechin.
- H. Robert Wallace, Auchenbrain, Mauchline.
- C. James Campbell & Sons, Illieston, Mid-Calder.
- C. J. & J. R. C. Smith, Galalaw, Kelso.
- C. Robert Wallace, Auchenbrain, Mauchline.

**CLASS 88. EWE**, above one Shear.—Premiums, £10, £5, and £2.

1. George & John Fairbairn, Middle Quarter, Carluke.
2. The Right Hon. A. J. Balfour, M.P., Whittingehame, Prestonkirk.
3. James Findlay, Newmill of Craigeassie, Forfar.
- V. James Campbell & Sons, Illieston, Mid-Calder.
- H. A. & James K. Smith, Leaston, Upper Keith.
- C. The Right Hon. A. J. Balfour, M.P., Whittingehame, Prestonkirk.

**CLASS 89. SHEARLING EWE or GIMMER.**—Premiums, £10, £5, and £2.

1. Archibald Cameron & Sons, Westside Farm, Brechin.
2. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
3. J. & J. R. C. Smith, Galalaw, Kelso.
- V. Archibald Cameron & Sons, Westside Farm, Brechin.
- H. Robert Forsyth, New Smailholm, Kelso.
- C. James Findlay, Newmill of Craigeassie, Forfar.
- C. William Ford, Fentonbarns, Drem.

**HALF-BRED.****PRESIDENT'S CHAMPION MEDAL for best Pen of Half-Breds.**

John Mark, Sunnyside, Prestonkirk.

**CLASS 90. TUP, above one Shear.**—Premiums, £12, £8, £4, and £2.

1. Richard Davidson, Swinnie, Jedburgh.
2. David Porter, Doddington, Wooler, R.S.O., Northumberland.
3. David Porter, Doddington, Wooler, R.S.O., Northumberland.
4. James A. W. Mein, Hunthill, Jedburgh.

**CLASS 91. SHEARLING TUP.**—Premiums, £12, £8, £4, and £2

1. John Mark, Sunnyside, Prestonkirk.
2. John Mark, Sunnyside, Prestonkirk.
3. John Mark, Sunnyside, Prestonkirk.
4. John Mark, Sunnyside, Prestonkirk.
- V. James A. W. Mein, Hunthill, Jedburgh.
- H. James A. W. Mein, Hunthill, Jedburgh.

**CLASS 92. EWE, above one Shear.**—Premiums, £10, £5, and £2.

1. A. & James K. Smith, Leaston, Upper Keith.
2. John Elliot, Pinnacle, Ancrum.
3. Arthur George Spence, Longyester, Gifford.
- V. A. & James K. Smith, Leaston, Upper Keith.

**CLASS 93. SHEARLING EWE or GIMMER.**—Premiums, £10, £5, and £2.

1. David Porter, Doddington, Wooler, R.S.O., Northumberland.
2. John Stewart, Saughland, Tynehead.
3. A. & James K. Smith, Leaston, Upper Keith.
- V. A. & James K. Smith, Leaston, Upper Keith.
- H. David Porter, Doddington, Wooler, R.S.O., Northumberland.
- C. John Stewart, Saughland, Tynehead.

**SHROPSHIRE.****PRESIDENT'S CHAMPION MEDAL for best Pen of Shropshires.**

Thomas A. Buttar, Corston, Coupar-Angus (Shearling Tup).

**CLASS 94. TUP, above one Shear.**—Premiums, £6, £4, and £2.

1. Thomas A. Buttar, Corston, Coupar-Angus.
2. Thomas A. Buttar, Corston, Coupar-Angus, "Quiescence."

**CLASS 95. SHEARLING TUP.**—Premiums, £6, £4, and £2.

1. Thomas A. Buttar, Corston, Coupar-Angus.
2. Thomas A. Buttar, Corston, Coupar-Angus.
3. Thomas A. Buttar, Corston, Coupar-Angus.

CLASS 96. EWE, above one Shear.—Premiums, £5, £3, and £2.

1. Thomas A. Buttar, Corston, Coupar-Angus.
2. Thomas A. Buttar, Corston, Coupar-Angus.

CLASS 97. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

1. Thomas A. Buttar, Corston, Coupar-Angus.
2. Thomas A. Buttar, Corston, Coupar-Angus.
3. Thomas A. Buttar, Corston, Coupar-Angus.

## OXFORD DOWN.

*PRESIDENT'S CHAMPION MEDAL for best Pen of Oxford Down.*

James T. Hobbs, Maisey Hampton, Fairford, Gloucester (Shearling Tup).

*Best Shearling Oxford-Down Tup in Class 98 bred in Scotland, to be registered in Oxford-Down Flock-Book before prizes will be paid—£5, £3, and £2, given by Oxford-Down Sheep-Breeders' Association.*

1. William Elliot, Raecleugh Head, Duns, "Everlasting II."
2. Andrew S. Elliot, Hollybush, Galashiels, "Scottish Crest."
3. William Elliot, Raecleugh Head, Duns, "Evergreen."

CLASS 98. SHEARLING TUP.—Premiums, £6, £4, and £2.

1. James T. Hobbs, Maisey Hampton, Fairford, Gloucester.
2. James T. Hobbs, Maisey Hampton, Fairford, Gloucester.
3. James T. Hobbs, Maisey Hampton, Fairford, Gloucester.
- V. William Elliot, Raecleugh Head, Duns, "Everlasting II."
- H. Andrew S. Elliot, Hollybush, Galashiels, "Scottish Crest."
- C. William Elliot, Raecleugh Head, Duns, "Evergreen."

CLASS 99. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

1. James T. Hobbs, Maisey Hampton, Fairford, Gloucester.
2. James T. Hobbs, Maisey Hampton, Fairford, Gloucester.
3. James T. Hobbs, Maisey Hampton, Fairford, Gloucester.
- V. Andrew S. Elliot, Hollybush, Galashiels.
- H. Andrew S. Elliot, Hollybush, Galashiels.
- C. Andrew S. Elliot, Hollybush, Galashiels.

## SUFFOLK.

*PRESIDENT'S CHAMPION MEDAL for best Pen of Suffolk Sheep.*

William Ford, Fentonbarns, Drem (Shearling Ewe or Gimmer).

CLASS 100. SHEARLING TUP.—Premiums, £6, £4, and £2.

*Not Forward.*

*Best Suffolk Ewe in Class 101 bred in Scotland—£5, given by the Suffolk Sheep Society.*

William Ford, Fentonbarns, Drem.

CLASS 101. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

1. William Ford, Fentonbarns, Drem.
2. William Ford, Fentonbarns, Drem.
3. William Kennedy, Luce Mains, Ecclefechan.

*Best Pen of Suffolk Ewe Lambs in Class 102 bred in Scotland—£5, given by the Suffolk Sheep Society.*

William Ford, Fentonbarns, Drem.

CLASS 102. THREE EWE LAMBS, uncoloured and untrimmed, except as to the squaring of the tail.—Premiums, £5, £3, and £2, given by the Suffolk Sheep Society.

1. William Ford, Fentonbarns, Drem.
2. William Kennedy, Luce Mains, Ecclefechan.
3. William Ford, Fentonbarns, Drem.
- H. Dr Robert Shirra Gibb, Boon, Lauder.

#### FAT SHEEP.

*Best Pen of Lambs in Class 103 got by a Suffolk Tup, and out of Cheviot or Blackface Ewes.*—Prize of £5, given by the Suffolk Sheep Society.

William Charles, Gammons, Rothienorman (Suffolk Tup and Blackface Ewes).

*Best Pen of Lambs in Class 103 got by a Suffolk Tup, and out of Border Leicester, Half-bred, or Three-parts-bred Ewes.*—Prize of £5, given by the Suffolk Sheep Society.

*No Entry.*

CLASS 103. Three FAT LAMBS, any Breed or Cross, dropped in the year of the Show.—Premiums, £5 and £3.

1. Andrew B. Dalgety, Hilton of Guthrie, Guthrie (Shropshire Tup and Border Leicester Ewe).
2. Thomas Hay, Mains of Brighton, Forfar (Oxford Tup and Half-bred Ewes).
- V. William Charles, Gammons, Rothienorman (Oxford Tup and Half-bred Ewes).
- C. William Charles, Gammons, Rothienorman (Suffolk Tup and Blackface Ewes).

#### SWINE

*PRESIDENT'S CHAMPION MEDAL for best Pen of Swine.*

William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian, "Broomhouse Hercules" (9031).

#### LARGE WHITE BREED.

CLASS 104. BOAR, farrowed before 1907.—Premiums, £6, £3, and £2.

1. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian, "Dalmeny Elector" (9799).
2. Robert D. Brown, The Groves, Old Auchinairn, Bishopbriggs, "Sir James" (11,069).
3. A. E. Todd, Stoneybank, Musselburgh, "Worsley Roger XVII." (10,233).
- H. James Rennie, 4 East North Street, Aberdeen, "Ned."

#### EXTRA STOCK.

The following was Very Highly Commended, and a Medium Silver Medal awarded.

William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian, "Broomhouse Hercules" (9031).

CLASS 105. BOAR, farrowed in 1907.—Premiums, £6, £3, and £2.

1. G. B. Shields, Dolphingstone, Tranent, East Lothian, "Dolphingstone Madrali II." (10,759).
2. David W. Gunn, Craigcrook Farm, Blackhall, near Edinburgh, "Craigcrook Kaiser."

CLASS 106. BOAR, farrowed in 1908.—Premiums, £4, £2, and £1.

1. David W. Gunn, Craigcrook Farm, Blackhall, near Edinburgh.
2. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian.
3. Robert D. Brown, The Groves, Old Auchinairn, Bishopbriggs.
- V. G. B. Shields, Dolphingstone, Tranent, East Lothian.
- H. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian.

CLASS 107. SOW, farrowed before 1907.—Premiums, £6, £3, and £2.

1. Thomas Simpson, Duddingston, Portobello, Edinburgh, "Colston Lady Snow VII." (15,556).
2. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian, "Broomhouse Ida III." (18,218).
3. David W. Gunn, Craigcrook Farm, Blackhall, near Edinburgh, "Craignook Perfection" (16,816).

CLASS 108. SOW, farrowed in 1907.—Premiums, £6, £3, and £2.

1. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian, "Broomhouse Ida VII." (20,554).
2. G. B. Shields, Dolphingstone, Tranent, East Lothian.
3. G. B. Shields, Dolphingstone, Tranent, East Lothian.

CLASS 109. SOW, farrowed in 1908.—Premiums, £4, £2, and £1.

1. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian.
2. Thomas Simpson, Duddingston, Portobello Edinburgh.
3. William B. Wallace, Broomhouse Farm, Corstorphine, Mid-Lothian.
- V. Robert D. Brown, The Groves, Old Auchinairn, Bishopbriggs.
- H. Thomas Simpson, Duddingston, Portobello, Edinburgh.
- C. David W. Gunn, Craigcrook Farm, Blackhall, near Edinburgh.

BERKSHIRE.

CLASS 110. BOAR, any age.—Premiums, £6, £3, and £2.

1. Laurence Currie, Minley Manor, Farnborough, Hants, "Minley Highmoor."
2. J. Jefferson, Peel Hall, Chester, "Peel Eclipse" (12,146).
3. J. Jefferson, Peel Hall, Chester, "Motcombe Charnier" (12,309).
- H. J. Jefferson, Peel Hall, Chester, "Peel Nelson" (13,342).

CLASS 111. BOAR, farrowed in 1908.—Premiums, £4, £2, and £1.

1. Laurence Currie, Minley Manor, Farnborough, Hants.
2. J. Jefferson, Peel Hall, Chester.
3. J. Jefferson, Peel Hall, Chester.

CLASS 112. SOW, any age.—Premiums, £6, £3, and £2.

1. J. Jefferson, Peel Hall, Chester, "Peel Coquette" (13,341).
2. J. Jefferson, Peel Hall, Chester, "Charming Josephine" (13,346).
3. J. Jefferson, Peel Hall, Chester, "Countess Augustus."

CLASS 113. SOW, farrowed in 1908.—Premiums, £4, £3, and £1.

1. J. Jefferson, Peel Hall, Chester.
2. Laurence Currie, Minley Manor, Farnborough, Hants.
3. J. Jefferson, Peel Hall, Chester.
- H. Laurence Currie, Minley Manor, Farnborough, Hants.
- C. Laurence Currie, Minley Manor, Farnborough, Hants.

## POULTRY

First Premium—*One Sovereign*. Second Premium—*Ten Shillings*. Where there are Six or more Entries, Third Premium—*Five Shillings*.

## CHAMPION MEDALS.

*Best Cock, any variety.*

The Countess of Kintore, Inglismaldie, Laurencekirk (Light Brahma).

*Best Hen, any variety.*

Chas. Edward Pickles, Kayfield House, Earby (Silver Hamburg).

*Best Cockerel, any variety.*

Charles Aitkenhead, Stud Farm, Seaham Harbour (Coloured Dorking).

*Best Pullet, any variety.*

Alex. M Prain, Unthank House, Inchtute (Minorca).

*Best Pen of Ducks.*

The Counters of Home, The Hirsell, Coldstream (Aylesbury Drake).

*Best Pen of Geese.*

W. Woods, Auctioneer, Worksop, Notts (Embsen Gander).

*Best Pen of Turkeys.*

Lord Leith of Fyvie, Fyvie Castle, Fyvie (Bronze Hen).

## CLASS 1. DORKING—Coloured. Cock.

1. Charles Aitkenhead, Stud Farm, Seaham Harbour.
2. The Countess of Home, The Hirsell, Coldstream.
- V. John Meikle, Bridge House, Monkton, Ayrshire.
- H. Mrs Hilda H. Farquhar, St Margaret's, Bridge of Weir.

## CLASS 2. DORKING—Coloured. Hen.

1. Charles Aitkenhead, Stud Farm, Seaham Harbour.
2. Charles Aitkenhead, Stud Farm, Seaham Harbour.
- V. William Morgan, Balcruvia, Windygates, Fife.

## CLASS 3. DORKING—Coloured. Cockerel.

1. Charles Aitkenhead, Stud Farm, Seaham Harbour.
2. Charles Aitkenhead, Stud Farm, Seaham Harbour.
- V. Alex. Cross of Knockdon, Maybole.

## CLASS 4. DORKING—Coloured. Pullet

1. Charles Aitkenhead, Stud Farm, Seaham Harbour.
2. Charles Aitkenhead, Stud Farm, Seaham Harbour.
- V. Mrs Hilda H. Farquhar, St Margaret's, Bridge of Weir.

**CLASS 5. DORKING—Silver Grey. Cock.**

1. Alex. Low, Drum Castle, Drumoak.
2. Thomas Davidson, The Kennels, Drummuir, Keith.
3. Alex. Robertson, Burnside, Newhills, Countesswells.
- V. George M'Bain, Linkwood, Elgin.
- H. George Duncan, Tillymanoch, Dunecht.
- H. Alex. Low, Drum Castle, Drumoak.
- C. George Duncan, Tillymanoch, Dunecht.

**CLASS 6. DORKING—Silver Grey. Hen.**

1. Thomas Davidson, The Kennels, Drummuir, Keith.
2. John Mechie, Grain Merchant, Auchtermuchty.
3. Thomas Davidson, The Kennels, Drummuir, Keith.
- V. Alex. Munro, Invereshie, Kincaird.

**CLASS 7. DORKING—Silver Grey. Cockerel.**

1. Charles Aitkenhead, Stud Farm, Seaham Harbour.
2. Alex. Cross of Knockdon, Maybole.
3. George M'Bain, Linkwood, Elgin.
- V. George M'Bain, Linkwood, Elgin.
- H. Thomas Davidson, The Kennels, Drummuir, Keith.
- C. Alexander Robertson, Burnside, Newhills, Countesswells.

**CLASS 8. DORKING—Silver Grey. Pullet.**

1. Thomas Davidson, The Kennels, Drummuir, Keith.
2. George M'Bain, Linkwood, Elgin.
3. Charles Aitkenhead, Stud Farm, Seaham Harbour.
- V. George M'Bain, Linkwood, Elgin.
- H. The Countess of Kintore, Inglismaldie, Laurencekirk.
- C. Alexander Robertson, Burnside, Newhills, Countesswells.

**CLASS 9. BRAHMAPOOTRA or COCHIN-CHINA. Cock.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Light Brahma).
2. T. S. Macfarlane, Underwood Road, Paisley (Cochin).
3. Alex. Fraser, 3 Summer Street, Woodside, Aberdeen (Cochin).
- V. George Archibald, Blebo Craigs, Cupar-Fife (Cochin).
- H. Alex. Fraser, 3 Summer Street, Woodside, Aberdeen (Cochin).
- C. J. D. Hay, Cultmalundie, Tibbermuir, Perth (Cochin).

**CLASS 10. BRAHMAPOOTRA or COCHIN-CHINA. Hen.**

1. Alex. M. Prain, Unthank House, Inchtute (Brahma).
2. George Archibald, Blebo Craigs, Cupar-Fife (Cochin).

**CLASS 11. BRAHMAPOOTRA or COCHIN-CHINA. Cockerel.**

1. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).
2. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).
- V. Alex. Fraser, 3 Summer Street, Woodside, Aberdeen (Cochin).

**CLASS 12. BRAHMAPOOTRA or COCHIN-CHINA. Pullet.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Partridge).
2. Robert M'Millan, 128 King Street, Kilmarnock (Cochin).
3. T. S. Macfarlane, Underwood Road, Paisley (Cochin).
- V. John Page, Main Street, Killin (Cochin).
- H. Mrs George Anderson, Crimongorth, Crimond, Peterhead (Brahma).
- H. Alex. Fraser, 3 Summer Street, Woodside, Aberdeen (Cochin).
- C. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).
- C. John Ferguson, 7 North Inglis Street, Dunfermline (Cochin).
- C. Alex. Robertson, Burnside, Newhills, Countesswells (Cochin).

## CLASS 13. SCOTCH GREY. Cock.

1. Alexander Ollar, Kilkerran Cottage, Campbeltown.
2. David Hastings, Glaister Cottage, Darvel.
- V. John Carswell, 148 Graham's Road, Falkirk.
- H. John Buchan, 65 Wallace Street, Falkirk.

## CLASS 14. SCOTCH GREY. Hen.

1. John Carswell, 148 Graham's Road, Falkirk.
2. Alexander Ollar, Kilkerran Cottage, Campbeltown.

## CLASS 15. SCOTCH GREY. Cockerel.

1. William Ramsay, Muirhouse, Crosshouse, Kilmarnock.
2. John Buchan, 65 Wallace Street, Falkirk.
3. David Hastings, Glaister Cottage, Darvel.
- V. John Carswell, 148 Graham's Road, Falkirk.
- H. James Gegg, Castle Campbell, Dollar.
- C. James Gegg, Castle Campbell, Dollar.
- C. Alexander Ollar, Kilkerran Cottage, Campbeltown.

## CLASS 16. SCOTCH GREY. Pullet.

1. John M. Retson, Langside Cottage, Lanark.
2. David Hastings, Glaister Cottage, Darvel.
3. Alexander Ollar, Kilkerran Cottage, Campbeltown.
- V. Peter Mitchell, Mossneuk, Airth Road Station.
- H. John Cunningham, Millbank, Dregghorn, Ayrshire.
- C. John Carswell, 148 Graham's Road, Falkirk.
- C. James Gegg, Castle Campbell, Dollar.
- C. William Ramsay, Muirhouse, Crosshouse, Kilmarnock.
- C. Peter Sutcliffe, Burnside, Banchory-Devenick.

## CLASS 17. HAMBURG—Black. Cock.

1. Chas. Edward Pickles, Kayfield House, Earby.
2. Seton M. Thomson, Preston House, Linlithgow.
- V. John F. Forsyth, Clackmannan.
- H. Chas. Edward Pickles, Kayfield House, Earby.
- C. The Countess of Home, The Hirsell, Coldstream.

## CLASS 18. HAMBURG—Black. Hen.

1. Charles Edward Pickles, Kayfield House, Earby.
2. Charles Edward Pickles, Kayfield House, Earby.
- V. John F. Forsyth, Clackmannan.
- H. The Countess of Home, The Hirsell, Coldstream.

## CLASS 19. HAMBURG—Any other Variety. Cock.

1. Charles Edward Pickles, Kayfield House, Earby (Silver).
2. Charles Edward Pickles, Kayfield House, Earby (Silver).
- V. J. M. Campbell, Bonnykelly, New Pitsligo (Silver).

## CLASS 20. HAMBURG—Any other Variety. Hen.

1. Charles Edward Pickles, Kayfield House, Earby (Silver).
2. Charles Edward Pickles, Kayfield House, Earby (Silver).
- V. J. M. Campbell, Bonnykelly, New Pitsligo (Silver).

## CLASS 21. HAMBURG—Any Variety. Cockerel.

1. Charles Edward Pickles, Kayfield House, Earby (Silver).
2. Charles Edward Pickles, Kayfield House, Earby (Gold).
- V. The Countess of Home, The Hirsell, Coldstream (Black).

CLASS 22. HAMBURG—Any Variety. Pullet.

1. Charles Edward Pickles, Kayfield House, Earby (Silver).
2. Charles Edward Pickles, Kayfield House, Earby (Black).
- V. The Countess of Home, The Hirsel, Coldstream (Black).

CLASS 23. PLYMOUTH ROCK. Cock.

1. Lord Leith of Fyvie, Fyvie Castle, Fyvie.
2. Alex. M. Prain, Unthank House, Inchture.
3. Mrs J. Whitehead, Tower Street, Selkirk.
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie.
- H. F. A. Semple, Sandiside, Milnthorpe, R.S.O.
- C. Lord Leith of Fyvie, Fyvie Castle, Fyvie.

CLASS 24. PLYMOUTH ROCK. Hen.

1. Alex. M. Prain, Unthank House, Inchture.
2. Andrew Leitch, The Cottage, Cameron Bridge, Windygates.
3. Lord Leith of Fyvie, Fyvie Castle, Fyvie.
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie.
- H. Alex. W. Gray, 131 High Street, Inverurie.

CLASS 25. PLYMOUTH ROCK. Cockerel.

1. L. H. & J. Nutter, Lancaster Road, Morecambe.
2. Lord Leith of Fyvie, Fyvie Castle, Fyvie.
3. John Meikle, Bridge House, Monkton, Ayrshire.
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie.

CLASS 26. PLYMOUTH ROCK. Pullet.

1. L. H. & J. Nutter, Lancaster Road, Morecambe.
2. Lord Leith of Fyvie, Fyvie Castle, Fyvie.
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie.

CLASS 27. MINORCA. Cock.

1. Alex. M. Prain, Unthank House, Inchture.
2. A. R. Dalrymple, Meadowview House, Leslie, Fife.
3. Thomas Currie, Craigoch, Kilkerran, Ayrshire.
- V. Robert Mitchell, Fowler Farm, Mauchline.
- H. John Graham, Kirkfield, Lanark.

CLASS 28. MINORCA. Hen.

1. Alex. M. Prain, Unthank House, Inchture.
2. John Thomson, Middleholm Cottage, Lesmahagow.
- V. John Graham, Kirkfield, Lanark.
- H. George Taylor, Edinburgh Cottage, Liberton.

CLASS 29. MINORCA. Cockerel.

1. Alex. M. Prain, Unthank House, Inchture.
2. John Graham, Kirkfield, Lanark.
- V. Robert Mitchell, Fowler Farm, Mauchline.
- H. George Taylor, Edinburgh Cottage, Liberton.

CLASS 30. MINORCA. Pullet.

1. Alex. M. Prain, Unthank House, Inchture.
2. J. Ewart M'Jarrow, Lockerbie.
3. F. H. Wilson, The Haining, Selkirk.
- V. F. H. Wilson, The Haining, Selkirk.

## CLASS 31. LEGHORN—White. Cock.

1. Alex. M. Prain, Unthank House, Inchtute.
2. John King, Gowanlea, Belmont, Ayr.
- V. Mrs John Gordon, Waterton, Dunecht.
- H. F. G. Young, Airyhall, Culta.

## CLASS 32. LEGHORN—White. Hen.

1. Alex. M. Prain, Unthank House, Inchtute.
2. James M'Leish, Bankfoot, Perthshire.
3. Mrs John Gordon, Waterton, Dunecht.
- V. Mrs George Shiell, Delrodie Cottage, Drummuir, Keith.
- H. F. Anderson, Aberchirder, Banffshire.
- C. Hugh Gillespie, Lyne of Skene, Dunecht.

## CLASS 33. LEGHORN—White. Cockerel.

1. Alex. M. Prain, Unthank House, Inchtute.
2. Alex. M. Prain, Unthank House, Inchtute.
- V. J. Ewart M'Jarrow, Lockerbie.
- H. J. Ewart M'Jarrow, Lockerbie.

## CLASS 34. LEGHORN—White. Pullet.

1. Alex. M. Prain, Unthank House, Inchtute.
2. Hugh Borthwick, Shielgreen, Peebles.
3. J. C. Ross, Stirling Road, Larbert.
- V. J. C. Ross, Stirling Road, Larbert.
- H. Mrs George Shiell, Delrodie Cottage, Drummuir, Keith.

## CLASS 35. LEGHORN—Any other Variety. Cock.

1. George Cooper, Woodlea, Dyce (Brown).
2. William Forbes, Kinloch Street, Carnoustie (Buff).
3. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black).
- V. Gilling Brothers, Lower Milton, Wells, Somerset (Brown).
- H. Alex. M. Prain, Unthank House, Inchtute (Brown).
- C. Robert Durward, Dunecht, Aberdeenshire (Brown).
- C. Robert Durward, Dunecht, Aberdeenshire (Brown).

## CLASS 36. LEGHORN—Any other Variety. Hen.

1. Miss Grace Burnett, Glamis Cottage, 30 Spital, Old Aberdeen (Brown).
2. Miss Grace Burnett, Glamis Cottage, 30 Spital, Old Aberdeen (Brown).
3. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black).
- V. Alex. M. Prain, Unthank House, Inchtute (Brown).
- H. Robert Durward, Dunecht, Aberdeenshire (Brown).
- C. Miss Grace Burnett, Glamis Cottage, 30 Spital, Old Aberdeen (Brown).

## CLASS 37. LEGHORN—Any other Variety. Cockerel.

1. Robert Durward, Dunecht, Aberdeenshire (Brown).
2. George Pirie, Market Street, Ellon (Black).
3. Alex. M. Prain, Unthank House, Inchtute (Brown).
- V. Gilling Brothers, Lower Milton, Wells, Somerset (Brown).
- H. Robert Durward, Dunecht, Aberdeenshire (Brown).
- C. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black).

## CLASS 38. LEGHORN.—Any other Variety. Pullet.

1. Alex. M. Prain, Unthank House, Inchtute (Brown).
2. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black).
3. Robert Durward, Dunecht, Aberdeenshire (Brown).
- V. Alexander Cows, 1 Castle Road, Ellon (Black).
- H. William Forbes, Kinloch Street, Carnoustie (Buff).
- C. George Pirie, Market Street, Ellon (Black).

CLASS 39. LANGSHAN. Cock.

1. Robert Anthony, Home Farm, Euxton, near Chorley, Lancs.
2. Richardson Bros., Muir, Bannockburn.
- V. James Heggie, Central Lodge, Hartlepool.

CLASS 40. LANGSHAN. Hen.

1. Robert Anthony, Home Farm, Euxton, near Chorley, Lancs.
2. Richardson Bros., Muir, Bannockburn.
3. Richardson Bros., Muir, Bannockburn.

CLASS 41. LANGSHAN. Cockerel.

1. James Heggie, Central Lodge, Hartlepool.

CLASS 42. LANGSHAN. Pullet.

1. Robert Anthony, Home Farm, Euxton, near Chorley, Lancs.
2. James Heggie, Central Lodge, Hartlepool.

CLASS 43. ORPINGTON—Black. Cock.

1. Alexander Cowe, 1 Castle Road, Ellon.
2. Charles Pattison, Main Street, Lennoxtown.
3. Alex. M. Frain, Unthank House, Inchtur.
- V. Mrs Gillespie, Wyndhead, Lauder.
- H. Mrs Gillespie, Wyndhead, Lauder.
- C. David Reid, Firthview, Portgordon.

CLASS 44. ORPINGTON—Black. Hen.

1. David Reid, Firthview, Portgordon.
2. David Reid, Firthview, Portgordon.
3. Richard Mills, Lorne Bar, Dunoon.
- V. George Taylor, Edinburgh Cottage, Liberton.
- C. William Morgan, Balcurvie, Windygates, Fife.

CLASS 45. ORPINGTON—Black. Cockerel.

1. David Reid, Firthview, Portgordon.

CLASS 46. ORPINGTON—Black. Pullet.

1. David Reid, Firthview, Portgordon.
2. Alexander Cowe, 1 Castle Road, Ellon.
- V. George Taylor, Edinburgh Cottage, Liberton.

CLASS 47. ORPINGTON—Buff. Cock.

1. David Reid, Firthview, Portgordon.
2. William Morgan, Balcurvie, Windygates, Fife.
3. David Reid, Firthview, Portgordon.

CLASS 48. ORPINGTON—Buff. Hen.

1. David Reid, Firthview, Portgordon.
2. George Cooper, Woodlee, Dyce.
- V. George Cooper, Woodlee, Dyce.
- H. Alexander Cowe, 1 Castle Road, Ellon.

CLASS 49. ORPINGTON—Buff. Cockerel.

1. David Reid, Firthview, Portgordon.
2. Charles Aitkenhead, Stud Farm, Seaham Harbour.
3. David Reid, Firthview, Portgordon.
- V. Mrs Harvey, 67 Leslie Road, Aberdeen.
- H. Mrs Harvey, 67 Leslie Road, Aberdeen.
- C. L. H. & J. Nutter, Lancaster Road, Morecambe.

## CLASS 50. ORPINGTON—Buff. Pullet.

1. L. H. & J. Nutter, Lancaster Road, Morecambe.
2. George Taylor, Edinburgh Cottage, Liberton.
3. David Reid, Firthview, Portgordon.
- V. George Cooper, Woodlea, Dyce.
- H. David Reid, Firthview, Portgordon.
- C. Maurice Jackson, High Green Farm, Silsden, Yorkshire.

## CLASS 51. ORPINGTON—Any other Variety. Cock.

1. Alex. M. Prain, Unthank House, Inchture (White).

## CLASS 52. ORPINGTON—Any other Variety. Hen.

1. Alex. M. Prain, Unthank House, Inchture (White).

## CLASS 53. ORPINGTON—Any other Variety. Cockerel.

1. Robert Anthony, Home Farm, Euxton, near Chorley, Lancashire (White).
2. Alex. M. Prain, Unthank House, Inchture (White).
- V. Peter Sutcliffe, Burnside, Banchory-Devenick (White).

## CLASS 54. ORPINGTON—Any other Variety.—Pullet.

1. Alex. M. Prain, Unthank House, Inchture (White).
2. Robert Anthony, Home Farm, Euxton, near Chorley, Lancashire (White).
- V. Peter Sutcliffe, Burnside, Banchory-Devenick (White).

## CLASS 55. WYANDOTTE—Gold or Silver. Cock.

1. C. E. Pickles, Kayfield House, Earby (Silver).
2. William Morgan, Balcurvie, Windygates, Fife (Gold).
- V. Fred. Argo, 24 Beverley Road, Inverurie (Gold).

## CLASS 56. WYANDOTTE—Gold or Silver. Hen.

1. C. E. Pickles, Kayfield House, Earby (Silver).
2. William Christie, Black Bull Inn, Inverurie (Silver).
- V. William Morgan, Balcurvie, Windygates, Fife (Silver).
- H. T. S. Macfarlane, Underwood Road, Paisley (Gold).

## CLASS 57. WYANDOTTE—Gold or Silver. Cockerel.

1. C. E. Pickles, Kayfield House, Earby (Gold).
2. J. M. Philipson, Chesterfield, Haydon Bridge (Silver).
3. Henry Maidment, Hayton Gate, Low Row, Carlisle (Silver).
- V. C. E. Pickles, Kayfield House, Earby (Gold).

## CLASS 58. WYANDOTTE—Gold or Silver. Pullet.

1. J. M. Philipson, Chesterfield, Haydon Bridge (Silver).
2. Fred. Argo, 24 Beverley Road, Inverurie (Silver).
3. Fred. Argo, 24 Beverley Road, Inverurie (Silver).
- H. Fred. Argo, 24 Beverley Road, Inverurie (Silver).
- C. Fred. Argo, 24 Beverley Road, Inverurie (Gold).
- C. Fred. Argo, 24 Beverley Road, Inverurie (Gold).
- C. William Christie, Black Bull Inn, Inverurie (Silver).

## CLASS 59. WYANDOTTE—Black or White. Cock.

1. John Clark, Kelly, Methlick (White).
2. James M'Leish, Bankfoot, Perthshire (White).

CLASS 60. WYANDOTTE—Black or White. Hen.

1. Lord Leith of Fyvie, Fyvie Castle, Fyvie (White).
2. Henry Maidment, Hayton Gate, Low Row, Carlisle (Black).
3. John Clark, Kelly, Methlick (White).
- V. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black).
- H. William Morgan, Balsurvie, Windygates, Fife (White).

CLASS 61. WYANDOTTE—Black or White. Cockerel.

1. Robert Anthony, Home Farm, Euxton, near Chorley, Lancashire (White).
2. Mrs George Anderson, Crimongorth, Crimond, Peterhead (White).
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie (White).
- H. John Graham, Kirkfield, Lanark (Black).

CLASS 62. WYANDOTTE—Black or White. Pullet.

1. William Grant, Methlick (White).
2. Robert Anthony, Home Farm, Euxton, near Chorley, Lancashire (White).
3. Lord Leith of Fyvie, Fyvie Castle, Fyvie (White).
- V. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black).

CLASS 63. WYANDOTTE—Any other Variety. Cock.

1. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).
2. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).
3. Hubert Wright, Mayfield, Keighley (Partridge).
- V. Alex. M. Prain, Unthank House, Inchture (Partridge).
- H. John P. Harle, East Craigie, Cramond Bridge (Partridge).
- C. William Morgan, Balcurvie, Windygates, Fife (Cuckoo).
- C. John Simpson, Buckie (Partridge).

CLASS 64. WYANDOTTE—Any other Variety. Hen.

1. Hubert Wright, Mayfield, Keighley (Partridge).
2. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).
- V. John Simpson, Buckie (Partridge).
- H. Alex. M. Prain, Unthank House, Inchture (Partridge).
- C. John Wharton, Honeycott Farm, Hawes, Yorks (Silver).

CLASS 65. WYANDOTTE—Any other Variety. Cockerel.

1. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).
2. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).
- V. Hubert Wright, Mayfield, Keighley (Partridge).

CLASS 66. WYANDOTTE—Any other Variety. Pullet.

1. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).
2. John Simpson, Buckie (Partridge).
- V. Hubert Wright, Mayfield, Keighley (Partridge).
- H. John Wharton, Honeycott Farm, Hawes, Yorks (Partridge).

CLASS 67. INDIAN GAME. Cock.

1. Alex. M. Prain, Unthank House, Inchture.

CLASS 68. INDIAN GAME. Hen.

*No Entry.*

CLASS 69. GAME—Old English. Cock.

1. John Hutt, Denend, Cardenden, Fife.
2. R. Drysdale, St Thomas, Cupar-Fife.
- V. David M'Lean, 20 Well Road, Lochgelly.
- H. John Hutt, Denend, Cardenden, Fife.
- C. Ernest Grant, Benholm, Forfar.

## CLASS 70. GAME—Old English. Hen.

1. John Hutt, Denend, Cardenden, Fife.
2. Ralph D. Moore, Deneshollow, Bearsden.
3. David M'Lean, 20 Well Road, Lochgelly.
- V. John Hutt, Denend, Cardenden, Fife.
- H. Ernest Grant, Benholm, Forfar.

## CLASS 71. GAME—Modern. Cock.

*Not Forward.*

## CLASS 72. GAME—Modern. Hen.

1. David Reid, Firthview, Portgordon.

## CLASS 73. GAME—Indian and Old English. Cockerel.

*No Entry.*

## CLASS 74. GAME—Indian and Old English. Pullet.

*No Entry.*

## CLASS 75. BANTAM—Game, any Variety, including Old English and Indian. Cock.

1. John Hutt, Denend, Cardenden, Fife (Old English).
2. John Tyrie, 11 East Sunnyside, Forfar (Duckwing).
3. Wm. Coutts, jun., Rosemount, Forfar (Pile).
- V. Adam Jamie, Coutties Wynd, Forfar (Black Red).
- H. Adam Jamie, Coutties Wynd, Forfar (Black Red).
- C. Ralph D. Moore, Deneshollow, Bearsden (Old English).
- C. Alexander Shepherd, Lily Cottage, Forfar (Modern).
- C. Watson & Yule, 8 Hunter Place, Aberdeen (Modern).

## CLASS 76. BANTAM—Game, any Variety, including Old English and Indian. Hen.

1. Wm. Coutts, jun., Rosemount, Forfar (Duckwing).
2. William Henderson, 41 Rumbling Well, Dunfermline (Pile).
3. John Hutt, Denend, Cardenden, Fife (Old English).
- V. Ralph D. Moore, Deneshollow, Bearsden (Old English).
- H. Watson & Yule, 8 Hunter Place, Aberdeen (Modern).

## CLASS 77. BANTAM—Any other Variety. Cock.

1. Lady Margaret Douglas Home, The Hirsel, Coldstream (Sebright).
2. John F. Forsyth, Clackmannan (Black Rosecomb).
- V. R. Duffus, Cairnaguheen, Aberdeen (Black Rosecomb).
- H. George W. Love, 10 and 12 Rankine Street, Johnstone (Rosecomb).
- C. Chas. E. Pickles, Kayfield House, Earby (Black Rosecomb).

## CLASS 78. BANTAM—Any other Variety. Hen.

1. George W. Love, 10 and 12 Rankine Street, Johnstone (Rosecomb).
2. Lady Margaret Douglas Home, The Hirsel, Coldstream (Sebright).
- V. Chas. E. Pickles, Kayfield House, Earby (Black Rosecomb).
- H. John F. Forsyth, Clackmannan (Black Rosecomb).

## CLASS 79. Any other recognised Breed of Poultry. Cock.

1. Mrs D. Mackenzie, Maryfield, Meigle (Spanish).
2. Andrew M'Lachlan, Westview, Belth (Andalusian).
3. Miss Rachel M. Bowman, Counte Rozel, St Peter Port, Guernsey (La Fleche).
- V. James Carille, 4 Thread Street, Paisley (Houdan).
- H. J. D. Hay, Cultmalundie, Tibbermuir, Perth (Japanese Silkie).
- C. Miss Rachel M. Bowman, Counte Rozel, St Peter Port, Guernsey (Vulturine).

**CLASS 80. Any other recognised Breed of Poultry. Hen.**

1. W. J. Stewart, Craigie Poultry Yards, Perth (Houdan).
2. Andrew M'Lachlan, Westview, Beith (Andalusian).
3. Mrs D. Mackenzie, Maryfield, Meigle (Spanish).
- V. Miss Rachel M. Bowman, Countess Rozel, St Peter Port, Guernsey (La Fleche).
- H. F. Anderson, Venturefair, Dunfermline (Creve Cœur).
- C. F. Anderson, Venturefair, Dunfermline (Houdan).
- C. J. D. Hay, Cultmalundie, Tibbermuir, Perth (Japanese Silk).

**CLASS 81. Any other recognised Breed of Poultry. Cockerel.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Sussex).
2. Lady Margaret Douglas Home, The Hirsell, Coldstream (Sebright).
- H. Adam Jamie, Countess's Wynd, Forfar (Game Bantam, Pile).

**CLASS 82. Any other recognised Breed of Poultry. Pullet.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Sussex).
2. John Tyrie, 11 East Sunnyside, Forfar (Black-red Bantam).
- V. John P. Harle, East Craigie, Cramond Bridge (Sebright).
- H. William Coutts, jun., Rosemount, Forfar (Old English Spangled).
- C. William Coutts, jun., Rosemount, Forfar (Modern Pile).

**CLASS 83. TABLE FOWLS—Any Breed or Cross, to be judged solely as Table Fowls, and without regard to fancy points. Pair of Cockerels.**

1. The Countess of Home, The Hirsell, Coldstream (Game and Orpington).
2. A. M. Prain, Unthank, Inchture (Indian Game Dorkings).

**CLASS 84. TABLE FOWLS—Any Breed or Cross, to be judged solely as Table Fowls, and without regard to fancy points. Pair of Pullets.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Indian Game and Dark Dorking).
2. The Countess of Home, The Hirsell, Coldstream (Game and Orpington).
- V. Mrs Harvey, 67 Leslie Road, Aberdeen (Orpington).

**CLASS 85. SELLING CLASS—Any Variety, price not to exceed 20s. Cock or Cockerel.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Dark Dorking).
2. Alexander M. Prain, Unthank House, Inchture (Wyandotte Cock).
3. The Countess of Home, The Hirsell, Coldstream (Dorking Cock).
- V. George Archibald, Blebo Craigs, Cupar-Fife (Brahma Cock).
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie (Plymouth Rock Cock).
- H. George Begg, Craigton Cottages, Banchoory-Ternan (Orpington Cock).
- C. Mrs J. Whitehead, Tower Street, Selkirk (Buff Orpington Cock).

**CLASS 86. SELLING CLASS—Any Variety, price not to exceed 20s. Hen or Pullet.**

1. The Countess of Kintore, Inglismaldie, Laurencekirk (Silver Dorking).
2. The Countess of Home, The Hirsell, Coldstream (Dorking Hen).
3. Alexander M. Prain, Unthank House, Inchture (Plymouth Rock Hen).
- H. Fred. Argo, 24 Beverley Road, Inverurie (Wyandotte Pullet).
- H. Lord Leith of Fyvie, Fyvie Castle, Fyvie (Plymouth Rock Hen).
- H. John Macbie, Grain Merchant, Auchtermuchty (Dorking Hen).
- C. Richardson Brothers, Muir, Bannockburn (Langshan).

**CLASS 87. SELLING CLASS—Any Variety, price not to exceed 10s. Cock or Cockerel.**

1. Mrs J. Whitehead, Tower Street, Selkirk (Black Orpington Cock).
2. Lord Leith of Fyvie, Fyvie Castle, Fyvie (Plymouth Rock Cock).
3. The Countess of Kintore, Inglismaldie, Laurencekirk (Orpington).
- V. Alexander Cowe, 1 Castle Road, Ellon (Buff Orpington Cock).
- H. Adam Jamie, Countess's Wynd, Forfar (Black Red Game Bantam Cock).
- C. Alexander M. Prain, Unthank House, Inchture (Orpington Cock).

CLASS 88. SELLING CLASS—Any Variety, price not to exceed 10s.  
Hen or Pullet.

1. Lord Leith of Fyvie, Fyvie Castle, Fyvie (Plymouth Rock Hen).
2. John Mechie, Grain Merchant, Auchtermuchty (Dorking Hen).
3. Richardson Brothers, Muir, Bannockburn (Dorking).
- V. Alexander M. Prain, Unthank House, Inchture (Leghorn Hen).
- H. Alexander Shepherd, Lily Cottage, Forfar (Modern Game Bantam Hen).
- C. George Begg, Craigton Cottages, Banchory-Ternan (Plymouth Hen).
- C. Adam Jamie, Coultie's Wynd, Forfar (Game Pile Bantam Hen).
- C. Andrew Leitch, The Cottage, Cameron Bridge, Windygates (Black Orpington Hen).

CLASS 89. DUCKS—Aylesbury. Drake.

1. The Countess of Home, The Hirsell, Coldstream.
2. The Countess of Home, The Hirsell, Coldstream.
- V. J. D. Hay, Cultmalundie, Tibbermuir, Perth.
- H. William Charles, Gammons, Rothienorman.

CLASS 90. DUCKS—Aylesbury. Duck.

1. The Countess of Home, The Hirsell, Coldstream.
2. The Countess of Home, The Hirsell, Coldstream.
- V. J. D. Hay, Cultmalundie, Tibbermuir, Perth.

CLASS 91. DUCKS—Aylesbury. Drake (Young).

1. The Countess of Home, The Hirsell, Coldstream.
2. The Countess of Home, The Hirsell, Coldstream.
- V. Robert F. Milne, Spital Mains, Berwick-on-Tweed.
- C. William Charles, Gammons, Rothienorman.

CLASS 92. DUCKS—Aylesbury. Duck (Young).

1. The Countess of Home, The Hirsell, Coldstream.
2. The Countess of Home, The Hirsell, Coldstream.
- V. Robert P. Milne, Spital Mains, Berwick-on-Tweed.
- H. William Charles, Gammons, Rothienorman.

CLASS 93. DUCKS—Rouen. Drake.

1. The Countess of Home, The Hirsell, Coldstream.
2. The Countess of Home, The Hirsell, Coldstream.
- V. William Robertson, Mains of Birness, Ellon.

CLASS 94. DUCKS—Rouen. Duck.

1. The Countess of Home, The Hirsell, Coldstream.
2. The Countess of Home, The Hirsell, Coldstream.
- V. William Robertson, Mains of Birness, Ellon.

CLASS 95. DUCKS—Any other Variety. Drake.

1. The Countess of Home, The Hirsell, Coldstream (Pekin).
2. The Countess of Home, The Hirsell, Coldstream (Pekin).
- V. George Archibald, Blebo Craigs, Cupar-Fife (Stockannack).
- H. W. Woods, Auctioneer, Worksop, Notts (Runner).

CLASS 96. DUCKS—Any other Variety. Duck.

1. The Countess of Home, The Hirsell, Coldstream (Pekin).
2. The Countess of Home, The Hirsell, Coldstream (Pekin).
- V. W. Woods, Auctioneer, Worksop, Notts (Pekin).

**CLASS 97. DUCKS—Any Variety (Aylesbury excepted). Drake (Young).**

1. The Countess of Home, The Hirsell, Coldstream (Rouen).
2. The Countess of Home, The Hirsell, Coldstream (Pekin).
- V. W. Woods, Auctioneer, Worksop, Notts (Rouen).

**CLASS 98. DUCKS—Any Variety (Aylesbury excepted). Duck (Young).**

1. W. Woods, Auctioneer, Worksop, Notts (Rouen).
2. The Countess of Home, The Hirsell, Coldstream (Pekin).
- V. The Countess of Home, The Hirsell, Coldstream (Rouen).

**CLASS 99. GEESE. Gander.**

1. W. Woods, Auctioneer, Worksop, Notts (Embsden).
2. Thomas Anderson, Mill of Fochel, Udney (Embsden).
3. W. Woods, Auctioneer, Worksop, Notts (Embsden).
- V. Arthur H. Fox-Brockbank, The Croft, Kirksanton, Cumberland (Embsden).
- H. The Countess of Kintore, Inglismaldie, Laurencekirk (Toulouse).
- H. J. & A. Muir, Rispaig, Whithorn (Toulouse).

**CLASS 100. GEESE. Goose.**

1. W. Woods, Auctioneer, Worksop, Notts (Embsden).
2. W. Woods, Auctioneer, Worksop, Notts (Toulouse).
- V. Lord Leith of Fyvie, Fyvie Castle, Fyvie (Toulouse).
- H. Arthur H. Fox-Brockbank, The Croft, Kirksanton, Cumberland (Embsden).

**CLASS 101. TURKEYS. Cock.**

1. Mrs Strachan, Cardenwell, Fyvie (Bronze).
2. James Durno, Jackstown, Rothienorman (Bronze).
3. W. Woods, Auctioneer, Worksop, Notts (American Bronze).
- V. The Countess of Home, The Hirsell, Coldstream (Bronze).

**CLASS 102. TURKEYS. Hen.**

1. Lord Leith of Fyvie, Fyvie Castle, Fyvie (Bronze).
2. George F. Barron, Thomastown, Auchterless (American Bronze).
- V. W. Woods, Auctioneer, Worksop, Notts (American Bronze).

## DAIRY PRODUCE

**CLASS 1. POWDERED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.**

1. Andrew Fleming, Threepland, Eaglesham.
2. Miss L. Strang, Transy Farm, Dunfermline.
3. Mrs Monteith, Croftfoot, Denny.
- V. William Rennie, Parkhead, Slamannan.
- H. Robert Gilmour, Stonebyres, Eaglesham.
- C. George Deans, South Fornet, Skene, Dunecht.
- C. Joseph B. Taylor, Crowbank Farm, Castlecary.

**CLASS 2. FRESH BUTTER, Three 1 lb. Rolls.—Premiums, £4, £2, and £1.**

1. William Rennie, Parkhead, Slamannan.
2. Andrew Fleming, Threepland, Eaglesham.
3. Miss L. Strang, Transy Farm, Dunfermline.
- V. Mrs Monteith, Croftfoot, Denny.
- H. Robert Gilmour, Stonebyres, Eaglesham.
- C. Miss Mary A. Dairymple, Elliston, St Boswells.
- C. Mrs Evelyn, Wotton House, Dorking.
- C. Mrs Fenwick, Broadlays, Dunning.

**CLASS 3. CHEDDAR CHEESE, 56 lb. and upwards.—**  
 Premiums, £5, £3, and £2.

1. J. C. Cuninghame, Boreland, Dunragit.
2. J. C. Cuninghame, Home Farm, Dunragit.
3. James Milroy, Galdenoch, Stoneykirk, Stranraer.
- V. William G. Plunkett, Craignell, Colmonell, Ayrshire.
- H. Robert Stevenson, Boghead, Galston.

**CLASS 4. CHEESE, 14 lb. and under.—Premiums, £3, £2, and £1.**

1. Alexander Cross of Knockdon, Maybole.
2. Arnold W. Saunders, Dromore Farm, Kirkcudbright.
3. James Milroy, Galdenoch, Stoneykirk, Stranraer.
- V. J. C. Cuninghame, Boreland, Dunragit.
- H. Robert Stevenson, Boghead, Galston.

## JUDGES

*Shorthorn*.—James Peter, Berkeley Castle Estate Offices, Berkeley; James Durno, Rothlebrishane, Fyvie.

*Aberdeen-Angus*.—Alex. Strachan, Wester Fowls, Alford, N.B.; Wm. Stewart, Nether Blairrock, Cullen.

*Galloway*.—Wm. Barbour, Cull Park, Castle Douglas; Wm. Stroyan, Culcaigrie, Twynholm.

*Highland*.—Duncan M'Diarmid, Camusericht, Rannoch Station.

*Ayrshire*.—Robert Wallace, Auchebrair, Mauchline.

*Fat Cattle and Fat Sheep*.—James White, Market Buildings, Aberdeen; George Walker, Tillygreig, Udn Station, Aberdeen.

*Clydesdale Stallions, Entire Colts, and Geldings*.—James Dick, Ballinton, Kippen Station; James Durno, Jackstown, Rothienorman; Wm. Park, Glen-shinnoch, Bishopston.

*Clydesdale Mares and Fillies*.—George Anderson, West Fingask, Old Meldrum; James Fleming, Frick Mains, Frickheim; Jas. A. Wallace, Claycrop, Kirkinner.

*Hunters*.—John Scott, The Broom, Lockerbie.

*Hackneys, Ponies, and Harness Horses*.—W. Watson Murray, Catter House, Drymen.

*Highland Ponies*.—William Logan, M.R.C.V.S., Inverness.

*Shetland Ponies*.—James Duncan,

Fern Villa, Inverness; John M'Martin, Craufurd, Lasswade.

*Blackface*.—Alex. Cowan, Spittalhill, Fintry; And. Fleming, Threepland, Eaglesham; Arch. Whyte, Glenmoy, Cortachy, Kirriemuir.

*Cheviot*.—Donald Innes, Sandside, Thurso; Robert Shiel, Sourhope, Yetholm, Kelso.

*Border Leicester*.—Matthew Ridley, Peelwell, Haydon Bridge; Joseph Lee, Congalton, Drem.

*Half-Bred*.—A. T. Elliot, Newhall, Galashiels.

*Shropshire*.—S. F. M. Nevett, Yorton, Shrewsbury.

*Oxford Down*.—J. H. Toppin, Musgrave Hall, Skelton, Penrith.

*Suffolk*.—Herbert E. Smith, The Grange, Walton, Ipswich.

*Swine*.—James Weir, Woodleele Asylum Farm, Lenzie, Glasgow.

*Poultry*.—A. K. Crichton, Estates Office, Bridge of Weir (classes 1 to 22 inclusive, 43 to 54 jointly with Mr Stainthorp, 75 to 88 inclusive, 89 to 98 jointly with Mr Stainthorp, 99 to 102 inclusive); R. Stainthorp, Darlington (classes 23 to 42 inclusive, 43 to 54 jointly with Mr Crichton, 55 to 74 inclusive, 89 to 98 jointly with Mr Crichton).

*Dairy Produce*.—Professor Drummond, Dairy School, Kilmarneck.

## II.—VETERINARY DEPARTMENT.

## CLASS EXAMINATIONS—1908.

Silver Medals were awarded to the following :—

## ROYAL (DICK) VETERINARY COLLEGE.

Junior Anatomy . . .	Wm. Dixon Connochie, Galashiels.
Senior Anatomy . . .	Hazlett Allison, Ballarena, Co. Derry.
Chemistry . . . . .	William Kendrick, Wrexham, N. Wales.
Biology . . . . .	Wm. Dixon Connochie, Galashiels.
Physiology . . . . .	Hugh Fraser, Gollanfield, Inverness.
Stable Management . . .	Joseph B. Idle, Harrogate.
Pathology and Bacteriology	James A. Robertson, Sydney, N.S.W.
Materia Medica . . . . .	Wm. M'Gregor Mitchell, Sunderland.
Hygiene and Dietetics . .	Frank Chambers, Dudley, Worcestershire.
Veterinary Medicine . . .	John Robson, Bellingham, Northumberland.
Veterinary Surgery . . .	John Robson, Bellingham, Northumberland.

## GLASGOW VETERINARY COLLEGE.

Junior Anatomy . . . . .	David Keir, Paisley.
Senior Anatomy . . . . .	James N. Reynard, Cambuslang.
Chemistry . . . . .	David Keir, Paisley.
Biology . . . . .	Alexander Ferguson, Glasgow.
Physiology . . . . .	Peter Meikle, Glassford, Strathaven.
Stable Management . . . .	Allan H. Macdougall, Helensburgh.
Pathology and Bacteriology	Fred. W. Hart, Dromara, Co. Down.
Materia Medica . . . . .	Fred. W. Hart, Dromara, Co. Down.
Hygiene and Dietetics . . .	James H. Crawford, Beith.
Veterinary Medicine . . . .	Fred. J. M'Call, Glasgow.
Veterinary Surgery . . . . .	John Rae, Glasgow.

22 Large Silver Medals, £14, 0s. 6d.

## III.—DISTRICT COMPETITIONS.

21 Districts—Grants of £12 each (Section I.) . . . . .	£252 0 0
13 " Grants of £15 each (Section II.) . . . . .	195 0 0
6 " Special Grants, £39; Medals, £3, 6s. . . . .	42 6 0
37 " Medals for Shows (62 Large, 13 Medium, 1 Minor) . . . . .	45 5 10
12 " Medals for Cottages and Gardens (21 Minor, 2 Medium) . . . . .	5 18 6
189 " Medals for Ploughing, 1907-8 . . . . .	45 13 6
<b>278</b>	<b>£586 3 10</b>

## ABSTRACT OF PREMIUMS.

Aberdeen Show . . . . .	£2585 17 4
District Competitions . . . . .	537 0 10
Veterinary Colleges . . . . .	14 0 6
	<b>£3186 18 8</b>

## EDINBURGH SHOW, 1907.

## ALTERATIONS IN PRIZE LIST.

On account of animals failing to comply with the Regulations as to calving and foaling, the following changes have taken place in the list of animals for which prizes were paid.

## ABERDEEN-ANGUS.

CLASS 11. HEIFER, calved on or after 1st December 1904.—  
Premiums, £10, £5, £3, and £2.

1. No. 138 T. H. Bainbridge, Eshott Hall, Felton, Northumberland, "Estrella of Eshott" (38,487).
- \* No. 142 Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Evie of Ballindalloch" (39,028).
2. No. 148 James Whyte, Hayston, Glamis, "Bashful Bet" (39,794).
3. No. 145 James Kennedy of Doonholm, Ayr, "Euroto" (39,206).
4. No. 141 John Ritchie Findlay, Aberlour House, Aberlour, "Prize" (38,913).
- H. No. 144 R. Wylie Hill of Balthayock, Perth, "Beauty of Balthayock" (39,127).
- C. No. 147 Reginald W. H. Crawford Leslie, of Rothie and Badenscotta, Rothie House, Rothie Norman, Aberdeenshire, "Ethel of Netherwell" (38,859).

## GALLOWAY.

CLASS 17. HEIFER, calved on or after 1st December 1904.—  
Premiums, £10, £5, £3, and £2.

1. No. 206 John Cunningham, Tarbreoch, Dalbeattie, "Maggie Lauder 5th of Tarbreoch" (18,829).
2. No. 210 Arthur H. Fox-Brockbank, The Croft, Kirksanton, Cumberland, "Jasmine of Blackcombe" (19,369).
- \* No. 204 Sir Robert W. Buchanan-Jardine, Bart., Castlemilk, Lockerbie, "Countess IV. of Castlemilk" (18,775).
3. No. 203 The Duke of Buccleuch and Queensberry, K.G., K.T., Drumlanrig Castle, Thornhill, Dumfriesshire, "Pride 37th of Drumlanrig" (18,755).
4. No. 216 Robert T. Scott, Drumhughry, Dalbeattie, "Camilla 19th of Drumhughry" (18,808).
- H. No. 212 Robert Graham, Auchengassel, Twynholm, "Handsome of Auchengassel" (18,867).
- C. No. 201 Thomas Biggar & Sons, Chapelton, Dalbeattie, "Maggie 4th of Chapelton" (18,792).

*The animals failing to qualify are marked thus (\*).*

## HIGHLAND.

CLASS 23. HEIFER, calved in 1904.—Premiums, £10, £5, £3, and £2.

1. No. 282 D. A. Stewart, Ensay, Portree, "Laochag."
- \* No. 269 The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Te Riabhach 8th of Atholl."
2. No. 280 The Earl of Southesk, Kinnaird Castle, Brechin, "Princess Cornelia" (6555).
- \* No. 279 Mrs Craig Sellar of Ardtornish, Morvern, Oban, "Sgiathach LIV." (6973).
- \* No. 281 D. A. Stewart, Ensay, Portree, "Guanach."
3. No. 277 The Countess-Dowager of Seafield, Castle Grant, Grantown, Strathspey, "Empress Elinor" (6511).
4. No. 271 The Duke of Atholl, K.T., Blair Castle, Blair-Atholl, "Mairi Ruadh 2nd of Atholl."

## AYRSHIRE.

CLASS 31. HEIFER, calved in 1905.—Premiums, £10, £5, and £3.

- \* No. 341 Sir Hugh Shaw Stewart, Bart., Ardgowan, Inverkip, "Green and Gold."
1. No. 339 Andrew Mitchell, Barcheskie, Kirkcudbright, "Brownie 2nd" (20,517).
- \* No. 335 John M'Alister, Ardyne, Toward, "Ardyne Lady Fair."
2. No. 340 Robert Osborne, Morton Mains, Thornhill, "Morton Mains Catervina."
- \* No. 334 Lt.-Col. Fergusson-Buchanan of Auchentorlie, Bowling, Dumbartonshire, "Auchentorlie Stroma."
3. No. 336 John G. Martin, Brandon, Brodick, Arran, "White Heather II." (18,766).
- C. No. 337 John G. Martin, Brandon, Brodick, Arran, "Princess Victoria II." (18,764).

## DRAUGHT MARES.

CLASS 43. YELD MARE, foaled before 1904.—Premiums, £12, £9, £6, and £4.

- \* No. 471 Robert Forrest, Knockinlaw, Kilmarnock, "Jean of Knockinlaw" (17,643).
1. No. 473 H. B. Marshall of Rachan, Broughton, Peeblesshire, "Mimosa" (16,911).
2. No. 474 H. B. Marshall of Rachan, Broughton, Peeblesshire, "Pomona" (16,328).
- \* No. 472 J. E. Kerr of Harviestoun Castle, Dollar, "Budding Rose."
3. No. 477 W. J. Yorke Scarlett of Gigha, Argyllshire, "Lady Lephen."
4. No. 470 Robert Chapman, Johnston, Gartcosh, "Winsome Baroness."
- C. No. 476 Messrs Murdoch, Hallside, Newton, Glasgow, "Scottish Jess" (15,713).

*The animals failing to qualify are marked thus (\*).*

# STATE OF THE FUNDS

OF

## THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

As at 30th NOVEMBER 1908.

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I. INVESTED IN CONSOLS, HERITABLE BONDS, DEBENTURE AND PREFERENCE RAILWAY STOCKS, BANK STOCKS, &c.	£100,852 2 6
II. ESTIMATED VALUE of Buildings, No. 3 George IV. Bridge . . . . .	£3,100 0 0
III. ESTIMATED VALUE of Furniture, Paintings, Books, &c. . . . .	1,000 0 0
	4,100 0 0
IV. ARREARS OF SUBSCRIPTIONS considered recoverable . . . .	145 19 0
V. BALANCES at 30th November 1908 DUE BY ROYAL BANK OF SCOTLAND ON ACCOUNT CURRENT . . . . .	£1,753 5 4
Due by Secretary . . . . .	0 10 0
	1,753 15 4
AMOUNT OF GENERAL FUNDS . . . . .	£112,851 16 10
VI. TWEEDDALE MEDAL FUND—	
Heritable Bond, at 3½ per cent . . . . .	£500 0 0

JOHN GILLESPIE, *Treasurer.*

ALEXR. CROSS, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 13th January 1909.

## VIEW OF RECEIPTS AND PAYMENTS

For the Year 1907-1908.

**RECEIPTS.**

1. ANNUAL SUBSCRIPTIONS AND ARREARS received . . . . .	£1,153	4	6
2. LIFE SUBSCRIPTIONS . . . . .	538	13	0
	<hr/>		
	£1,691	17	6
3. INTERESTS AND DIVIDENDS—			
Interests . . . . .	£2,374	14	11
Dividends . . . . .	1,292	11	3
	<hr/>		
	3,667	6	2
4. TRANSACTIONS . . . . .		38	14
5. RECEIPT on account of previous Shows . . . . .		2	15
6. RECEIPTS from Aberdeen Show . . . . .	8,530	5	7
7. INVESTMENTS realised . . . . .	£3,800	0	0
	<hr/>		
8. INCOME-TAX repaid for year to 5th April 1908 . . . . .		203	0
		7	
	<hr/>		
SUM OF RECEIPTS . . . . .	£14,133	19	4

**PAYMENTS.**

1. ESTABLISHMENT EXPENSES—			
Salaries and Wages . . . . .	£1,472	0	0
Fou - duty, Taxes, Coal, Gas, Insurance, Repairs, and Furnishings . . . . .	375	11	1
	<hr/>		
	£1,847	11	1
2. FEE TO AUDITOR of Accounts for year 1906-1907 . . . . .	75	0	0
3. EDUCATION . . . . .	201	2	2
4. CHEMICAL DEPARTMENT . . . . .	204	6	11
5. VETERINARY DEPARTMENT . . . . .	52	2	1
6. BOTANICAL AND ENTOMOLOGICAL DEPARTMENT . . . . .	49	9	0
7. DAIRY DEPARTMENT . . . . .	364	6	6
8. BUILDINGS FOR SMALL HOLDINGS . . . . .	200	0	0
9. SOCIETY'S TRANSACTIONS . . . . .	787	12	10
10. ORDINARY Printing, Advertising, and Postages . . . . .	213	0	6
11. FEE of Consulting Engineer . . . . .	25	0	0
12. GRANTS to Public Societies . . . . .	25	0	0
13. SPECIAL GRANT . . . . .	50	0	0
14. MISCELLANEOUS PAYMENTS . . . . .	148	11	1
15. INVESTMENTS made . . . . .	£5,839	1	3
	<hr/>		
16. PAYMENTS in connection with Edinburgh Show . . . . .	147	3	0
17. PAYMENTS in connection with Aberdeen Show—			
Premiums . . . . .	£2,397	12	4
General Expenses . . . . .	4,063	7	2
	<hr/>		
	6,460	19	6
18. PREMIUMS for Local Shows and District Competitions . . . . .	629	1	1
	<hr/>		
SUM OF PAYMENTS . . . . .	11,480	5	9
	<hr/>		
BALANCE OF RECEIPTS . . . . .	£2,653	13	7
	<hr/>		

JOHN GILLESPIE, *Treasurer.*ALEX. CROSS, *Member of Finance Committee.*WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 13th January 1909.

# **ABSTRACT of the ACCOUNTS of the HIGHLAND and CHARGE.**

1. BALANCES due by Royal Bank of Scotland on Account Current at 30th November 1907 . . . . .	£1,139	3	0
2. ARREARS of Subscriptions outstanding at 30th Nov. 1907 . . . . .	£128	12	6
Whereof due by Members who have compounded for life, and whose arrears are thereby extinguished . . . . .	£5	13	6
Sums ordered to be written off . . . . .	58	18	0
		64	11 6
			64 1 0
3. INTERESTS AND DIVIDENDS—			
(1) Interests—			
On Heritable Bonds, less Income-tax . . . . .	£731	10	0
On Debenture and Preference Stock, do. . . . .	1,554	5	10
On Annuity Stocks, do. . . . .	70	5	10
On Deposit Receipts with Edinburgh Corporation, less Income-tax, and with Royal Bank . . . . .	18	13	3
	£2,374	14	11
(2) Dividends—			
On Consols, less Income-tax . . . . .	£95	0	0
On Bank Stocks . . . . .	1,197	11	3
		1,292	11 3
			3,667 6 2
4. SUBSCRIPTIONS—			
Annual Subscriptions . . . . .	£1,292	4	0
Life Subscriptions . . . . .	538	13	0
			1,830 17 0
5. TRANSACTIONS—Sales and Advertisements . . . . .			38 14 1
6. RECEIPTS on Account of previous Shows . . . . .			2 15 5
7. RECEIPTS from Aberdeen Show . . . . .			8,530 5 7
8. INVESTMENTS REALISED . . . . .			3,800 0 0
9. INCOME-TAX repaid for year to 5th April 1908 . . . . .			203 0 7
SUM OF CHARGE . . . . .	£19,276	2	10

# AGRICULTURAL SOCIETY of SCOTLAND for the Year 1907-1908.

## DISCHARGE.

<b>1. ESTABLISHMENT EXPENSES—</b>		
Salaries and Wages—Secretary, £900; Clerk, £300; Second Clerk, £200;		
Messenger, £72	£1,472	0 0
Fee-duty, £28; Taxes, £48, 4s. 7d.	76	4 7
Coals and Gas	31	18 9
Repairs and Furnishings—Special, £172 6s. 8d.; Ordinary, £76, 18s. 10d.	249	5 6
Insurances	18	2 3
	£1,847	11 1
<b>2. FEE to Auditor of Accounts for 1906-1907</b>	75	0 0
<b>3. EDUCATION—</b>		
<b>(1) Forestry—</b>		
Vote to Lecturer in Edinburgh University	£50	0 0
Expenses of Examination	24	17 0
	£74	17 0
<b>(2) Agriculture—</b>		
Expenses of National Diploma Examination	126	5 2
		201 2 2
<b>4. CHEMICAL DEPARTMENT—</b>		
(1) Fee to Chemist	£50	0 0
(2) Chemist's Fees for Analyses to Members, and Expenses	91	10 0
	£141	10 0
(3) Expenses of Manuring and Sheep-Grazing Experiments, £183, 1s. 6d.—Less Grant from Board of Agriculture, £75, and proceeds of Sheep sold, £51, 18s. 11d.	56	2 7
(4) Expenses of Turnip Investigation	2	10 4
		200 2 11
<b>5. VETERINARY DEPARTMENT—</b>		
(1) Medals to Students	£14	0 6
(2) Grant for Experiments as to Fertility in Sheep	10	10 0
(3) Donation and expenses in connection with Tuberculosis (Animals) Committee	27	11 7
(4) Fee for examination of Cattle	4	4 0
		56 6 1
<b>6. BOTANICAL DEPARTMENT—</b>		
Fee to Botanist for year	£25	0 0
Testing Samples of Seeds for Members	24	9 0
		49 9 0
<b>7. DAIRY DEPARTMENT—</b>		
(1) Expenses of Examination at Kilmarnock, £77, 11s. 10d., less Entry Fees, £21	£56	11 10
(2) Special Grant—Vote to Dairy School at Kilmarnock	100	0 0
(3) Milk Record Scheme £278 4 8		
Less Share received from Districts in 1907	75	0 0
	202	15 8
(4) Experiments with Cows in different temperatures	4	19 0
		364 6 6
<b>8. BUILDINGS FOR SMALL HOLDINGS.—Competitive exhibition of plans, &amp;c—</b>		
(1) Erection of Model Cottage in Exhibition	£110	0 0
(2) Prizes and expenses	90	0 0
		200 0 0
<b>9. SOCIETY'S TRANSACTIONS</b>		
		787 12 10
<b>10. ORDINARY PRINTING, £71, 11s. 9d.; Advertising, £21, 13s. 11d.; Stationery, Books, &amp;c., £46, 16s. 4d.; Postages, &amp;c., £65; Bank Charges, £7, 18s. 6d.</b>		
	313	0 6
<b>11. FEE to Consulting Engineer</b>		
	25	0 0
<b>12. GRANTS to Public Societies—Scottish Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5</b>		
	25	0 0
<b>13. SPECIAL GRANT.—Sum voted in connection with case of Gillespie v. Riddell</b>		
	50	0 0
<b>14. MISCELLANEOUS PAYMENTS</b>		
	148	11 1
<b>15. INVESTMENTS made</b>		
	5,839	1 3
<b>16. PAYMENTS in connection with Edinburgh Show, 1907</b>		
	147	3 0
<b>17. PAYMENTS in connection with Aberdeen Show, 1908—Premiums, £2897, 12s. 4d.; General Expenses, £4063, 7s. 3d.</b>		
	6,460	19 6
<b>18. PREMIUMS for Local Shows and District Competitions</b>		
	629	1 1
<b>19. ARREARS of Subscriptions struck off as irrecoverable</b>		
	57	1 6
<b>20. ARREARS outstanding at 30th November 1908</b>		
	145	19 0
<b>21. BALANCES at 30th November 1908—</b>		
On Account Current with Royal Bank of Scotland Edinburgh Account	£1565	0 4
London Account £188, 6s.; due by Secretary 10s.	188	15 0
	1,753	15 4
<b>SUM OF DISCHARGE</b>	£19,276	2 10

JOHN GILLESPIE, *Treasurer.*

ALEXR. CROSS, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

## ABSTRACT of the ACCOUNTS

## CHARGE.

## 1. LOCAL SUBSCRIPTIONS—

Aberdeenshire Voluntary Assessment . . . . .	£603 1 4
Forfarshire (Eastern Division) Voluntary Assessment . . . . .	232 17 7
Banffshire Voluntary Assessment . . . . .	157 1 5
Kincardineshire Voluntary Assessment . . . . .	152 4 9
Town of Aberdeen, Donation by the Magistrates . . . . .	100 0 0
	<hr/>
	£1,245 5 1

## 2. AMOUNT COLLECTED DURING SHOW—

Drawn at Gates . . . . .	£3,774 19 0
Drawn at Grand Stand . . . . .	562 7 0
Catalogues and Awards sold . . . . .	254 8 10
Cloak-Rooms and Lavatories . . . . .	4 9 5
	<hr/>
	4,596 4 3
3. FORAGE SOLD . . . . .	15 9 6
4. RENT OF STALLS . . . . .	2,124 3 0
5. RENT OF REFRESHMENT BOOTHS . . . . .	250 0 0
6. ADVERTISEMENTS IN CATALOGUE AND PREMIUM LIST . . . . .	74 9 3
7. SUBSCRIPTIONS IN AID OF PREMIUM LIST . . . . .	193 1 10
8. INCOME FROM TWEEDDALE MEDAL FUND . . . . .	16 12 6
9. INTEREST FROM DEPOSIT RECEIPTS WITH EDINBURGH CORPORATION . . . . .	14 7 2
10. COMMISSION ON POULTRY SOLD . . . . .	0 13 0

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£8,530 5 7

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*Note.*—From the above balance of . . . . . £3,069 6 1  
 There falls to be deducted—  
 Premiums undrawn at 30th November 1908, amounting to . . . . . 188 5 0  
 Making the probable Surplus . . . . . £1,881 1 1

EDINBURGH, 13th January 1909.

## of the ABERDEEN SHOW, 1908.

## DISCHARGE.

<b>1. SHOWYARD EXPENDITURE—</b>		
Fitting up Showyard . . . . .	£2,268	10 3
Rosettes, £33, 4s. 5d.; Repairing and Carriage of Turnstiles, £9, 1s. 3d.; Railway Cartages and Carriages, £20, 16s. 5d. . . . .	68	2 1
Cutting Grass in Showyard, £4, 11s.; Feeding and Penning Poultry, £5, 4s. 10d. . . . .	9	15 10
Miscellaneous . . . . .	17	0 4
	£2,353	8 6
<b>2. FORAGE . . . . .</b>	250	18 0
<b>3. POLICE . . . . .</b>	34	7 3
<b>4. TRAVELLING EXPENSES . . . . .</b>	143	3 3
<b>5. HOTEL AND LUNCHEONS—</b>		
Hotel Bill for 33 Directors, 8 Stewards, 36 Judges, &c. . . . .	£219	11 11
Luncheons and Breakfasts in Showyard for Directors, Judges, and Committee . . . . .	120	7 5
		339 19 4
<b>6. MUSIC . . . . .</b>	128	17 10
<b>7. PRINTING . . . . .</b>	272	10 4
<b>8. ADVERTISING and Bill-posting . . . . .</b>	165	16 11
<b>9. HIGHLAND INDUSTRIES . . . . .</b>	8	0 0
<b>10. VETERINARY INSPECTION . . . . .</b>	10	10 0
<b>11. CONCERT for Attendants . . . . .</b>	3	0 0
<b>12. TREASURER . . . . .</b>	25	0 0
<b>13. ENGINEER . . . . .</b>	5	0 0
<b>14. FORESTRY EXHIBITION . . . . .</b>	14	0 0
<b>15. ASSISTANTS and Attendants . . . . .</b>	235	16 10
<b>16. POSTAGES . . . . .</b>	56	5 0
<b>17. MISCELLANEOUS . . . . .</b>	16	13 11
	£4,063	7 2
<b>18. PREMIUMS drawn at 30th November 1908 . . . . .</b>	2,397	12 4
	£6,460	19 6
<b>BALANCE OF RECEIPTS . . . . .</b>	2,069	6 1
	£8,530	5 7

JOHN GILLESPIE, *Treasurer.*ALEXR. CROSS, *Member of Finance Committee.*WM. HOME COOK, C.A., *Auditor.*

## ABSTRACT of the ACCOUNTS of the

## CHARGE.

## I. FUNDS at 30th November 1907—

Amount on Heritable Bond, at $3\frac{1}{2}$ per cent . . . . .	£3,500 0 0
£3,193, 6s. 8d. North British Railway Company 3 per cent Debenture Stock, purchased at . . . . .	2,650 0 0
£550 Lancashire and Yorkshire Railway Company 3 per cent Debenture Stock, purchased at . . . . .	611 10 6
£190 London and North-Western Railway Company 4 per cent Guaranteed Stock, purchased at . . . . .	259 1 11
	<hr/>
	£7,020 12 5
BALANCE in Royal Bank on Account Current . . . . .	395 16 0
	<hr/>
	£7,416 8 5

## II. INTEREST ON INVESTMENTS—

On £3,500 on Heritable Bond at $3\frac{1}{2}$ per cent, £122, 10s., less tax £6, 2s. 6d. . . . .	£116 7 6
On £3,193, 6s. 8d. North British Railway Company 3 per cent Debenture Stock, £95, 16s., less tax £4, 15s. 10d. . . . .	91 0 2
On £550 Lancashire and Yorkshire Railway Com- pany 3 per cent Debenture Stock, £16, 10s., less tax 16s. 6d. . . . .	15 13 6
On £190 London and North-Western Rail- way Company 4 per cent Guaranteed Stock, £7, 12s., less tax 7s. 8d. . . . .	7 4 4
	<hr/>
	230 5 6
SUM OF CHARGE . . . . .	<hr/>
	£7,646 13 11

EDINBURGH, 13th January 1909.

**ARGYLL NAVAL FUND for Year 1907-1908.****DISCHARGE.****I. ALLOWANCES to the five following Recipients—**

Donald Patrick C. Campbell (fifth year)	.	.	.	£40	0	0
John S. Binny Scott (fifth year)	.	.	.	40	0	0
Francis Gordon Hunter (third year)	.	.	.	40	0	0
Patrick Bruce Lawder (second year)	.	.	.	40	0	0
Thomas F. Fenton-Livingstone (first year)	.	.	.	40	0	0
				<hr/>		
				£200	0	0

**II. FUNDS as at 30th November 1908—**

Amount on Heritable Bond, at 3½ per cent	.	£3,500	0	0
£3,193, 6s. 8d. North British Railway Company				
3 per cent Debenture Stock, purchased at	.	2,650	0	0
£550 Lancashire and Yorkshire Railway Com-				
pany 3 per cent Debenture Stock, purchased				
at	.	611	10	6
£190 London and North-Western Railway Com-				
pany 4 per cent Guaranteed Stock, purchased				
at	.	259	1	11
		£7,020	12	5
Balance in Royal Bank on Account Current	.	426	1	6
		<hr/>		
			7,446	13 11

**SUM OF DISCHARGE** . . £7,646 13 11

**JOHN GILLESPIE, Treasurer.**

**ALEXR. CROSS, Member of Finance Committee.**

**WM. HOME COOK, C.A., Auditor.**

## PROCEEDINGS AT BOARD MEETINGS.

### MEETING OF DIRECTORS, 5TH FEBRUARY 1908.

*Present.*—*Ordinary Directors*—Mr John M'Hutchen Dobbie; Mr David Wilson; Mr Thomas Gordon Duff; Colonel Dudgeon; Mr H. M. Leadbetter; Mr Alex. Cross; Mr William Duthie; Mr James Stenhouse; Mr E. Douglas Paton; Mr Charles E. N. Leith Hay; Mr Charles Douglas; Captain John Gilmour; Sir Archd. Buchan Hepburn, Bart.; Mr John Cran. *Extraordinary Directors*—Dr R. Shirra Gibb; Mr Jonathan Middleton; Mr James Hope; Mr E. Hedley Smith, B.L. *Hon. Secretary*—Mr Alexr. M. Gordon. *Auditor*—Mr Wm. Home Cook, C.A. *Chemist*—Mr James Hendrick, B.Sc. Mr Alex. Cross in the chair.

#### *Aberdeen Show, 1908.*

*Special Prizes.*—A number of Special Prizes were accepted, and votes of thanks accorded to the donors.

*Sizes of Boxes for Horses.*—Consideration was given to the sizes of boxes for the different classes of horses and ponies. Some discussion took place as to boxes for ponies, it being decided that boxes of 6 feet by 10 feet would be large enough for Shetland ponies, but that for other ponies the boxes be 8 feet by 10 feet.

*Veterinary Surgeon.*—Mr James Thomson, V.S., Aberdeen, was appointed Veterinary Inspector for the Aberdeen Show, on the usual conditions.

#### *Stirling Show, 1909.*

It was resolved that the Stirling Show of 1909 be held on Tuesday, 20th July, and three following days.

#### *Tuberculosis (Animals) Committee.*

A letter was read from the Secretary of the Tuberculosis (Animals) Committee inviting the Society to appoint other three representatives to act on that Committee.

The Board appointed Mr Douglas, Mr Speir, and Mr Duthie to act as the Society's representatives, along with the Chairman of the Board appointed at last Meeting.

#### *Science.*

It appeared from the Minutes of the Science Committee that the Schedule of Unit Values of Manures and Feeding-Stuffs for 1908 had been revised, and it was resolved to have it published as heretofore.

It was reported that the Board of Agriculture had agreed to co-operate with the Society in the continuance of the Manure and Mutton Experiments for the years 1908, 1909, and 1910, on the lines proposed at the last Meeting of the Board.

#### *Produce of Cows kept at Different Temperatures.*

Mr JOHN SPEIR reported, with regard to the proposed experiment with cows to test the influence of different temperatures on their produce, that the trials would be carried out on his farm; but it was suggested that the experiment should be carried out in duplicate, provided the Board of Agriculture agree to meet half the expense, and that the Society should vote a sum not exceeding £100 towards the expenses of the experiment. This was agreed to.

*Slag on Pastures.*

There was also considered the carrying out of experiments to test further the influence of slag on certain soils in different districts. The Secretary was instructed to communicate with the three Scottish Agricultural Colleges to inquire if they would assist in the supervision of the work, the Society to bear the expense. Till the scheme was further advanced, so that the cost might be estimated, the Science Committee did not feel justified in asking for a grant.

*Buildings for Small Holdings.*

The prize plans for buildings for small holdings, a list of which has already been published, were exhibited. The Committee recommended that, in view of the large number of entries, the prizes be increased by giving the third prize winner £1 as well as a medal, the highly commended winners the bronze medal, and the commended the medium bronze medal. It was agreed to publish the four best plans in the 'Transactions,' if possible in the first issue. In the meantime they would be exhibited in the Edinburgh Exhibition, and it was thought that there would be no difficulty in getting models of the first prize plans erected there.

*Railway Facilities for Breeding Season.*

A letter was read from the Secretary of the Clydesdale Horse Society inviting the co-operation of this Society in efforts being made to induce the Railway Companies to extend, so as to include September, the reduced rates now given for Stallions and Mares in journeys for mating from 1st January to 31st August.

The Board unanimously agreed to the request, and instructed the Secretary accordingly.

MEETING OF DIRECTORS, 4TH MARCH 1908.

*Present.*—*Ordinary Directors*—Mr John M'Hutchen Dobbie; Mr H. M. Leadbetter; Captain Thos. Hope; Mr Alex. Cross; Mr A. H. Anderson; Mr James Stenhouse; Mr David Ferrie; Mr E. Douglas Paton; Mr Charles Douglas; Mr John Murray; Mr John Cran. *Extraordinary Directors*—Dr R. Shira Gibb; Mr John Speir; Mr Jonathan Middleton; Mr E. Hedley Smith, B.L. *Treasurer*—Very Rev. John Gillespie, LL.D. *Hon. Secretary*—Mr Alex. M. Gordon. *Engineer*—Professor Stanfield. Mr Alex. Cross in the chair.

Before proceeding to the business of the Meeting, the CHAIRMAN made appropriate reference to the death of the Marquis of Linlithgow and of Mr David Hume, Barrelwell.

*Foreign Fodder and Animal Diseases.*

Dr GILLESPIE, in accordance with notice given, moved as follows: "That this Society memorialise the Board of Agriculture to prohibit the importation of all fodder, hides, and other articles likely to carry infection from countries in which Foot-and-Mouth and other contagious animal diseases exist."

Mr ANDERSON seconded, and the motion was unanimously agreed to.

*Vacancy in Board of Directors.*

On the recommendation of the Committee on Office-Bearers, it was unanimously resolved to appoint Mr David Arnot, Edzell Mains, Edzell, an Extraordinary Director for the current year, in room of the late Mr Hume, Barrelwell.

*Centenary of Garioch Farmer Club.*

A letter was read from Mr George A. Bruce, Insch, Aberdeenshire, Secretary of the Garioch Farmer Club, making application for a special grant towards the Prize Fund for the Centenary Show of the Club, proposed to be held at Insch this year.

On the motion of Dr GILLESPIE, seconded by Mr CROSS, it was unanimously resolved that a grant of £25 be given.

*Tuberculosis (Animals) Committee.*

The SECRETARY submitted an application by Mr Sydney Mager, Secretary to this Committee, for a contribution to meet expenses.

Mr DOUGLAS moved that a donation of £20 for 1908 be given. Dr GILLESPIE seconded, and the motion was unanimously agreed to.

*Meat and Milk Supply Legislation.*

A letter was read from Mr Howie, the Secretary of the Ayrshire Agricultural Association, stating that the Directors of that Society were of opinion that it would be desirable to form a separate Committee for Scotland for the consideration of prospective legislation in connection with the Milk and Meat Supply, and asking if the Highland and Agricultural Society would take the initiative in the organising of this Scottish Committee.

After consideration, it was decided that the better course would be to adhere to the arrangement of having one Committee for both England and Scotland. It was further resolved that it be remitted to the following Committee—viz., Mr Speir (Convener), Mr Douglas, Mr M'Hutchen Dobbie, Dr Shirra Gibb, Dr Wilson, Dr Gillespie, and Mr M'Caig—to consider the Dairies (Scotland) Bill, and report to next Meeting of the Board.

*The Veterinary Surgeons Act, 1881, Amendment Bill.*

The SECRETARY stated that from holders of the Society's Veterinary Certificate and others he had received expressions of strong objection to the Veterinary Surgeons Act, 1881, Amendment Bill. The Bill was promoted by the Royal College of Veterinary Surgeons, and the object of it was partly to increase the funds in the hands of the college. It was proposed to impose a fee of one guinea upon veterinary practitioners, and to provide that those who did not pay the fee in the month of January in each year would be expelled from the list of those who are entitled to practice and receive fees as veterinary surgeons. The Bill would seriously curtail the privileges of the holders of the Society's Veterinary Certificate.

Mr DOUGLAS suggested that the Society should watch the progress of the Bill.

Dr GILLESPIE said the Bill affected the interests of the farmer as well as those of the veterinary surgeon. They ought to have a special committee to look after the matter. It was a mischievous Bill, a most selfish Bill; it was trades unionism in its very worst form.

It was remitted to the Science Committee to oppose the Bill.

## MEETING OF DIRECTORS, 1st APRIL 1908.

*Present.*—*Vice-President*—Colonel Thomas Innes. *Ordinary Directors*—Mr John M'Hutchen Dobbie; Mr Thomas Gordon Duff; Sir John Macpherson-Grant, Bart.; Captain Thomas Hope; Mr Alex. Cross; Mr A. H. Anderson; Mr John M'Caig; Mr Wm. Duthie; Mr C. M. Cameron; Mr James Stenhouse; Mr W. S. Park; Mr David Ferrie; Mr Charles Douglas; Sir Arch. Buchan Hepburn, Bart.; Mr John M. Aitken; Mr John Cran. *Extraordinary Directors*—Mr D. Arnot; Mr Wm. Shaw Adamson; Mr W. T. Malcolm; Dr R. Shirra Gibb; Mr Andrew Hutcheson; Mr James Hope; Mr Charles Howatson. *Auditor*—Mr Wm. Home Cook, C.A. *Chemist*—Mr James Hendrick. *Engineer*—Professor Stanfield. Mr Alex. Cross in the chair.

*Royal Commission on Whisky.*

A letter was read from the Secretary of the Morayshire Farmers' Club regarding the desirability of evidence being offered to the Royal Commission on Whisky upon the importance to Scottish agriculture of the interests of malt distilleries being properly safeguarded.

It was resolved that the Royal Commission be asked to receive two witnesses appointed by the Society to give evidence on this subject; the Board agreeing to ask Mr James Hope, East Barnes, Dunbar, and Mr Jonathan Middleton, Glastullich, Ross-shire, to act as the witnesses.

*Dairies (Scotland) Bill.*

It was reported that the Special Committee appointed to consider and report upon the Dairies (Scotland) Bill had held a meeting that day, but having been unable to

complete their deliberations asked permission to delay submitting their report till the meeting of the Board in May.

This was agreed to, authority being given to the Committee to arrange, if they should think this desirable, to organise a conference of representatives of different societies for the consideration of the Bill.

*Sheep Stock Valuations—The Ardery Case.*

On the motion of Mr HUTCHESON, seconded by Mr FERRIE, it was resolved to obtain the opinion of the Society's Law Agents as to whether or not it would be competent for the Society to give a contribution in aid of a fund being raised for carrying to the House of Lords the case of Gillespie v. Riddell, recently decided in the Court of Session.

MEETING OF DIRECTORS, 6TH MAY 1908.

*Present.—Ordinary Directors*—Mr John M'Hutchen Dobbie; Mr W. S. Ferguson; Colonel R. F. Dudgeon; Mr Hugh M. Leadbetter; Mr Alex. Cross; Mr A. H. Anderson; Mr John M'Caig; Mr Wm. Duthie; Mr James Stenhouse; Mr David Ferrie; Mr E. D. Paton; Mr Charles Douglas; Mr John Murray; Sir Archd. Buchan Hepburn, Bart.; Mr John M. Aitken. *Extraordinary Directors*—Colonel Charles M'Inroy, C.B.; Mr W. T. Malcolm; Dr R. Shirra Gibb; Mr Andrew Hutcheson; Mr John Speir; Mr Jonathan Middleton; Mr Charles Howatson. *Treasurer*—Very Rev. John Gillespie, LL.D. *Auditor*—Mr Wm. Home Cook, C.A. *Chemist*—Mr James Hendrick. *Engineer*—Professor Stanfield. Mr Alex. Cross in the chair.

*Aberdeen Show, 1908.*

*Catering.*—A letter was read from Mr James Hay requesting, on account of ill-health, to be relieved from his contract as caterer in the Committee Booth in the Showyard.

It was resolved to assent to Mr Hay's request, and the Secretary was instructed to convey to Mr Hay the best wishes of the Board for a satisfactory recovery from his illness, and to offer him hearty thanks for his efficient services as caterer in the Shows of the Society.

Mr John Mitchell, County Hotel, Aberdeen, was appointed caterer in the Committee Booth at the Show in room of Mr Hay.

*Special Prize for Shorthorn Bull.*—It was resolved that the special prize of £10 offered by the Shorthorn Society for 1908 for the best yearling shorthorn bull belonging to an exhibitor residing within the counties of Elgin, Banff, Aberdeen, Kincardine, and Forfar be awarded at the Aberdeen Highland Show, it being understood that only bulls entered in the Society's ordinary class be eligible to compete for this prize.

*Veterinary Surgeons Act, 1881, Amendment Bill.*

The SECRETARY stated that in response to the report of the Privy Council the Veterinary Surgeons Act Amendment Bill had been amended in a way which partly gives effect to the views expressed by the Directors of this Society at their last meeting. The Bill still proposed that the annual fee should be compulsory and retrospective, and that it would have to be paid by holders of this Society's Veterinary Certificate as well as by other veterinary surgeons.

It was resolved that the Secretary be instructed to intimate to the Council of the Royal College of Veterinary Surgeons that the Directors of this Society were still strongly of opinion that the annual registration fee should be voluntary in the case of past graduates, and that this Society would take every means in its power to oppose any provision which would impose any burden upon, or in any way limit the privileges of, the holders of this Society's Veterinary Certificate.

*Produce of Cows kept at different Temperatures.*

A letter was read from the Board of Agriculture and Fisheries approving of the proposed trials with cows kept at different temperatures, and agreeing to give a grant of £50 anent the expenses.

It was resolved that the Secretary be instructed to inform the Board of Agriculture that it was considered desirable that the trials should be conducted at two or three other farms in addition to Mr Speir's, and that this could be done if the Board could see its way to increase its grant to £100.

*Dairies (Scotland) Bill.*

An exhaustive report on the Dairies (Scotland) Bill was submitted by the Special Committee on the subject, the report being approved generally.

Dr GILLESPIE moved: "That the Board welcome and support reasonable regulations for securing the purity and quality of the dairy produce raised at home and offered for sale, but resolved that earnest representations be made to the Government by deputation or otherwise, to have satisfactory measures taken to make sure that no dairy produce will be admitted from any country in which the regulations for the sanitary control of the production and handling of dairy produce are not at least equal to the regulations in our own country."

Mr SPER seconded, and the motion was unanimously adopted.

*Royal (Dick) Veterinary College.*

Mr John M. Martin was reappointed the representative of the Highland and Agricultural Society on the Board of Management of the Royal (Dick) Veterinary College for the three years beginning 1st July next.

*Marking of Foreign Meat.*

The SECRETARY read a circular from the Vale of Alford Agricultural Association with reference to the proposed marking of imported meat and mutton.

No action was taken in the matter.

*The N.D.A.*

Rev. Dr GILLESPIE submitted a report on the examination for the National Diploma in Agriculture held at Leeds in the preceding week. Of 51 students who sat for Part I., 68 per cent passed. The percentage of Scotch students who passed was 68·6. Of 48 who sat for the II. or final part, 29, or 60 per cent, passed. The percentage of Scottish passes was 78. There was no jealousy or rivalry between the countries, but they in Scotland were more interested in the Scottish students. The Scottish Colleges represented were those of Glasgow and Aberdeen. There were no students from Edinburgh. As showing the extensive desire to obtain these honours, he might mention that sixteen agricultural colleges were represented.

*The Arderly Case.*

The Board took into consideration the question of the recent decision in the First Division of the Court of Session on the entailed estate case of Gillespie v. Riddell, and adopted the following resolutions:—

1. That a sum of £50 be voted in aid of the fund being raised to carry the case to the House of Lords.

2. That having in view the consideration that the mere reversion of the decision of the Court of Session by the House of Lords would not be a satisfactory solution of the question, it is advisable that a Bill should be promoted in Parliament which would place this matter on lines that would be fair and reasonable to all the parties concerned.

3. That if legislation on these lines is promoted, the Highland and Agricultural Society would be prepared to contribute in aid of the necessary expenses.

*The Motion Yard.*

The SECRETARY stated that a difficulty had arisen regarding the extent of the Motion Yard in the Show of the Society, on account of a growing desire amongst exhibitors to have space in the Motion Yard for combined collections of exhibits in motion and exhibits not in motion. This arrangement worked well so long as it was adopted only to a moderate extent. In recent years there had been a large and constant increase in the extent of space applied for in the Motion Yard for exhibits not in motion, with the result that the Motion Yard was so extended in its area that the Society found it difficult, in some cases impossible, to obtain a sufficient extent of ground suitable for exhibits in motion.

Mr MIDDLETON, (Steward of Implements, having explained the difficulties experienced at recent Shows, stated that it had become necessary to reserve the Motion Yard more strictly for exhibits in motion.

It was resolved that the Regulations bearing on the matter be enforced.

MEETING OF DIRECTORS, 3RD JUNE 1908.

*Present.*—*Ordinary Directors*—Mr John M'Hutchen Dobbie ; Mr William Taylor ; Mr David Wilson, D.Sc. ; Mr Thomas Gordon Duff ; Mr Hugh M. Leadbetter ; Mr Alex. Cross ; Mr A. H. Anderson ; Mr Athole S. Hay ; Mr James Stenhouse ; Mr W. S. Park ; Mr David Ferrie ; Mr E. Douglas Paton ; Mr Charles Douglas ; Captain John Gilmour ; Mr John Cran. *Extraordinary Directors*—Colonel Charles M'Inroy, C.B. ; Mr David Arnot ; Captain Clayhills Henderson, R.N. ; Dr R. Shirra Gibb ; Mr Andrew Hutcheson ; Mr John Speir ; Mr Jonathan Middleton ; Mr Charles Howatson ; Mr E. Hedley Smith. *Chemist*—Mr James Hendrick. Mr Alex. Cross in the chair.

*Aberdeen Show, 1908.*

*Alcoholic Drinks in Showyard.*—It was resolved that a circular letter be sent to exhibitors in the Implement Department of the Show calling their attention to the regulation prohibiting the giving of alcoholic drinks to visitors at Stands in the Show, and requesting exhibitors to give careful attention to this regulation.

*Concert for Attendants.*—Authority was given to the Secretary to have arrangements made for the usual Concert for Attendants in the Showyard, the Concert to take place this year on the Tuesday evening.

*Dumfries Show, 1910.*

Letters were read from the County Clerks of Dumfries and Wigtown intimating that their County Councils had resolved to raise, by means of a voluntary assessment on landowners as in former years, subscriptions in aid of the funds of the Highland Show to be held at Dumfries in 1910.

The Secretary was instructed to convey the thanks of the Directors to these County Councils.

*Science Committee.*

*Slag Experiments.*—Dr DAVID WILSON reported that they had completed arrangements for carrying out experiments on pasture land with slag, lime, and potash. The three Agricultural Colleges were co-operating with the Society in these experiments.

*Veterinary Surgeons Bill.*—The Committee had also considered the Veterinary Surgeons Bill in its amended form. They asked power to watch over the measure, with authority, if necessary, to oppose the Bill in Parliament until the amendments suggested by this Society were given effect to.

*Produce of Cows kept at Different Temperatures.*

It was reported that the Board of Agriculture had agreed to increase its grant in aid of these trials to £100 if they are carried out at other three farms in addition to that of Mr Speir. The Directors regarded this as very satisfactory, and gave the Committee authority to carry out the experiments in this extended form.

*Fertility in Sheep.*

It was reported that Dr Marshall had completed his investigations on this subject, and that the results are reported in last volume of the 'Transactions.'

*Access to Mountains (Scotland) Bill.*

Mr DOUGLAS asked and obtained permission to bring before the Board the Access to Mountains (Scotland) Bill now before Parliament. He moved : "That the Access to Mountains (Scotland) Bill be remitted to the following Committee with powers to prepare such Amendment to the Bill as may seem desirable and to place these before the Government," the Committee to consist of Mr Douglas (Convener), Mr Hutcheson, Mr Ferrie, Mr Arnot, Mr Taylor, and Mr Ferguson.

It was resolved that the above resolution be submitted to the General Meeting of Members to be held later in the day.

## MEETING OF DIRECTORS, 4TH NOVEMBER 1908.

*Present.—Ordinary Directors*—Captain Thomas Hope; Mr Alex. Cross; Mr A. H. Anderson; Mr John M'Caig; Mr James Stanhouse; Mr David Ferrie; Mr Charles Douglas; Captain John Gilmour; Mr John Murray; Mr John Cran; Mr C. H. Scott Plummer; Mr John M'Hutchens Dobbie; Mr David Wilson, D.Sc.; Colonel R. F. Dudgeon; Mr Hugh M. Leadbetter. *Extraordinary Directors*—Captain Arch. Stirling; Mr John Edmond; Dr R. Shirra Gibb; Mr Andrew Hutcheson; Mr Jonathan Middleton; Mr James Hope; Mr Charles Howatson; Mr Robert Paterson. *Treasurer*—Very Rev. John Gillespie, LL.D. *Consulting Engineer*—Professor Stanfield. Dr Wilson, and afterwards Mr Alex. Cross, in the chair.

The CHAIRMAN referred in feeling terms to the death of Sir James Gibson-Craig and Lord Herries.

*Chairman and Committees.*

On the motion of Dr GILLESPIE, seconded by Mr HUTCHESON, Mr Alex. Cross of Knockdon was unanimously re-elected Chairman of the Board for the ensuing year.

Mr Cross thanked the Board for the honour conferred on him.

The Standing Committees for the ensuing year were appointed, the names to be printed as usual in the Premium Book.

*Representatives on Other Bodies.*

The following were appointed representatives of the Society on the Boards of Management of the undernoted institutions for the ensuing year—viz.: *West of Scotland Agricultural College*—Very Rev. John Gillespie, LL.D., Mouswald Manse, Ruthwell, R.S.O.; Mr John M. Martin, Crauford, Lasswade. *Edinburgh and East of Scotland College of Agriculture*—Dr R. Shirra Gibb, Boon, Lauder; Mr James Macdonald, Secretary. *Aberdeen and North of Scotland College of Agriculture*—Mr T. Gordon Duff of Drummuir, Keith; Mr William Duthie, Tarves. *Royal (Dick) Veterinary College*—Mr John M. Martin, Lasswade.

*Office-Bearers and Directors.*

It was resolved that in future the Office-Bearers' Committee consist of the following—viz., (1) the four Ordinary Directors for the district in which the Show for the year is to be held, (2) one Ordinary Director from each of the other Show districts, and (3) the Chairman of the Board, the Hon. Secretary, and the Treasurer of the Society, *ex officio*.

*Aberdeen Show.*

It was reported that the surplus from the Show would be about £1880.

A complaint having been made that some of the prize horses had not been paraded owing to the attendants failing to be at their posts at the time, it was agreed that the owners of such stock, if making entries for future Shows, should be warned by the Secretary, and informed that a repetition of the offence would lead to their exclusion.

It was intimated that the Implement Steward, with the assistance of the Society's Engineer, had made a careful examination of the M'Ainsh-Robertson grain-drying rack, and had recommended that some recognition of its merits should be given by the Society. In view, however, of the inclement weather of the past September, and the fact that the rack was said to have been largely in use, it was resolved to await reports on trials during the winter before deciding on the nature of the award.

The STEWARD OF IMPLEMENTS also reported on a new combined plough and drill sower brought out by a Mr Rugg, a Caithness tradesman, and obviously fitted to be of very great advantage, especially on small holdings. The machine was not an absolutely new invention, but its present form was distinctly ingenious, and it was considered worthy of notice in the report of the Show. This was agreed to.

*Stirling Show, 1909.*

*Showyard.*—The SECRETARY stated that arrangements had been completed with the Officer of Woods and Forests and Messrs Dewar Brothers for the use of the ground in the King's Park for the Show.

*Local Fund.*—A letter was submitted from the Town Clerk of Stirling intimating that a contribution of £100 had been voted by the Town Council of Stirling, and that a free supply of water would be given by the Stirling Waterworks Commissioners.

The Secretary was instructed to convey the thanks of the Board to the Town Council and the Waterworks Commissioners.

A large number of special prizes were accepted, and votes of thanks were passed to the donors.

*Veterinary Inspection.*—In connection with the Cawdor Cup for mares and fillies offered by the Clydesdale Horse Society, a letter was read from the secretary of that society asking the Directors to nominate three of their number to meet with an equal number of directors of the Glasgow Agricultural Society and the Clydesdale Horse Society, to consider the question of enforcing veterinary inspection for animals competing for the Cawdor Cup. The Show Committee recommended that this Society should not take part in adjusting conditions to be attached by the Clydesdale Horse Society to the cup. This was agreed to.

#### *Dumfries Show, 1910.*

The SECRETARY reported that for the Show of 1910 they had been able, through Dr Gillespie, to arrange for a yard in close proximity to the town of Dumfries. They were specially indebted to Mr Wm. Johnston, horse-dealer, owner of the ground, who had left the terms absolutely in their own hands. Dr GILLESPIE referred to the public spirit which had been manifested by Mr Johnston.

The County Clerk of Kirkcudbright intimated a voluntary assessment by his County Council of 1d. per £, old Scots valuation, on owners of land in aid of the expenses of the Show.

#### *Veterinary Surgeons Bill.*

The SECRETARY submitted the Minutes of the Science Committee with respect to the Veterinary Surgeons Bill, which is being promoted by the Royal College of Veterinary Surgeons. The promoters of the Bill had met the Society fairly in regard to the privileges of the holders of Society's Veterinary Certificate. It was agreed that the Bill would be amended so as to exempt from the fee of £1, 1s. the holders of the Society's Veterinary Certificate who had become members of the Royal College of Veterinary Surgeons in accordance with the agreement which the College and the Society entered into in 1879.

The COMMITTEE reported that there were certain other provisions in the Bill which they were of opinion ought to be closely watched, as they appear to aim at unreasonably restricting the freedom of owners of stock, and they asked power to consider the Bill further.

Dr GILLESPIE said he had great sympathy with those who were in opposition to this Bill, and other agricultural societies should keep their eyes upon it, and agitate this question. It appeared to him that the veterinary surgeons were claiming an exclusive right to practice, which was not claimed to the same extent in respect of the human subject by the medical profession, and he did not think it right that the veterinary surgeons should make such claims as were embodied in this Bill.

The recommendations of the Committee were adopted.

#### *Meat Inspection in Scotland.*

On the recommendation of the Science Committee, a resolution was adopted urging upon the Local Government Board that there should be a uniform system of meat inspection for the whole country, and that all meat, whether home or imported, should be presented in such form as admits of its being thoroughly inspected.

#### *Grouse Disease Inquiry.*

The SECRETARY read an application for a grant to the funds for meeting the expenses incurred by the Departmental Committee appointed by the Board of Agriculture to inquire into the question of grouse disease. It was stated that a similar application had been made two years ago, when no subscription was given.

The Board did not see its way to take any action in the matter.

#### *Scottish Agricultural Organisation Society.*

A letter was submitted from the Secretary of the Scottish Agricultural Organisation Society making application for a grant in aid of the work of that Society, particularly in the forming of co-operative milk depots and creameries.

The letter was referred to the Finance Committee for consideration and report.

*Buildings for Small Holdings.*

It was reported that the competitive exhibition of plans suitable for buildings for small holdings had been carried out with success and had excited a good deal of interest.

*Proposed New Railway Demurrage Rules.*

The Standing Orders having been suspended, Mr HUTCHESON moved that "This Meeting nominate the following Committee to inquire into the new regulations made by the Railway Companies (and which come into effect on 1st January 1910) as to demurrage charges, siding rents, and other matters, and to report to Meeting—viz., Mr Hutcheson (Convener), Dr Gillespie, Mr Cross, and Dr Wilson.

Mr ANDERSON seconded, and the motion was unanimously adopted.

## MEETING OF DIRECTORS, 2ND DECEMBER 1908.

*Present.*—*Vice-President*—Captain Clayhills Henderson, R.N. *Ordinary Directors*—Captain Thomas Hope; Mr Alex. Cross; Mr A. H. Anderson; Mr C. M. Camerou; Mr James Stenhouse; Mr J. Ernest Kerr; Mr David Ferris; Mr E. Douglas Paton; Mr Charles Douglas; Captain John Gilmour; Mr John Murray; Sir Archibald Buchan Hepburn, Bart.; Mr John M. Aitken; Mr John Cran; Mr John M'Hutchen Dobbie; Mr W. S. Ferguson; Mr David Wilson, D.Sc.; Colonel R. F. Dudgeon; Sir John Macpherson-Grant, Bart. *Extraordinary Directors*—Mr John Edmond; Mr J. Kemp Smith; Mr W. T. Malcolm; Mr Andrew Hutcheson; Mr John Speir; Mr Jonathan Middleton; Mr James Hope; Mr Charles Howatson; Mr E. Hedley Smith; Mr Robert Paterson. *Treasurer*—Very Rev. John Gillespie, LL.D. *Hon. Secretary*—Mr Alex. M. Gordon. *Chemist*—Mr James Hendrick, B.Sc. Mr Alex. Cross in the chair.

*Stirling Show, 1909.*

*Prize List.*—The Reports of the Shows Committee of 3rd November and 2nd December 1908 were dealt with.

A letter was read from Mr Scott Plummer suggesting that separate classes be introduced for four-year-old hunters, but in view of the small number of entries of hunters at former Stirling Shows the Board did not see its way to introduce these classes.

*Sale of Catalogue.*—It was resolved that the Catalogue be on sale in the Showyard at 8 A.M. on the opening day of the Show.

*Judges.*—The SECRETARY reported that, out of 900 schedules sent out to Exhibitors at the last three Shows of the Society inviting nomination of judges, less than 200 had been returned. It was agreed that in the list of judges to be put before the meeting of 18th January the names of those who had been recommended during the past three years should be included.

*Veterinary Surgeons Act, 1881, Amendment Bill.*

On the recommendation of the Science Committee, it was resolved to ask the promoters of this Bill to amend it by the introduction of a clause to the effect "that nothing in this Act shall prevent the employment of uncertificated persons for the performance of minor operations or such other services as have been commonly performed by these persons in the past."

*Inspection of Meat.*

With reference to the new regulations for the inspection of meat, the Directors expressed their disappointment that the Local Government Board had not given to veterinary surgeons the position which was their due. In respect to the duties connected with the inspection of meat, the sanitary inspector should not be put before the veterinary surgeon, and it was considered that not only the veterinary profession, but agriculture, had a distinct grievance in the matter.

Mr ANDREW HUTCHESON, in supporting the action of the Directors, said they ought to continue their protest. An ordinary sanitary inspector knew nothing whatever about meat inspection.

*Scottish Agricultural Organisation Society.*

The Finance Committee reported that it did not see its way to recommend the Society to give financial support to forms of co-operative trading, but that it approved of the recommendations of the Shows Committee that a grant of £50 be set aside for the development of the poultry industry amongst small holders in the Highlands, and that the assistance of the Scottish Agricultural Organisation Society be invited in the allocation of this grant. The minutes of the Committee were approved.

MEETING OF DIRECTORS, 13TH JANUARY 1909,

*Present.—Ordinary Directors*—Mr Alex. Cross; Mr A. H. Anderson; Mr John M'Caig; Mr William Duthie; Mr James Stenhouse; Major F. J. Carruthers; Mr David Ferrie; Mr E. Douglas Paton; Mr Charles Douglas; Captain John Gilmour; Mr John Marr; Mr C. H. Scott Plummer; Mr John M'Hutchen Dobbie; Mr William Taylor; Mr W. S. Ferguson; Mr David Wilson, D.Sc.; Mr Thomas Gordon Duff; Sir John Macpherson-Grant, Bart.; Mr H. M. Leadbetter. *Extraordinary Directors*—Provost Jas. Thomson; Captain Graham Stirling; Colonel R. C. Mackenzie; Mr John Edmond; Mr Parlan Macfarlan; Mr W. T. Malcolm; Dr R. Shirra Gibb; Mr Andrew Hutcheson; Mr John Speir; Mr Jonathan Middleton; Mr James Hope; Mr Charles Howatson; Mr E. Hedley Smith; Mr Robert Paterson. *Treasurer*—Very Rev. John Gillespie, LL.D. *Auditor*—Mr William Home Cook, C.A. *Chemist*—Mr James Hendrick, B.Sc. *Consulting Engineer*—Prof. R. Stanfield. Mr Alex. Cross in the chair.

*Stirling Show, 1909.*

*Stewards.*—The Stewards of the various departments were appointed as follows: Cattle—Rev. Dr Gillespie; Horses—Mr Ferguson, Pictstonhill, with Mr Leadbetter, Legerwood, as Assistant Steward; Sheep, Swine, &c.—Dr Shirra Gibb, Boon; Forage—Mr W. T. Malcolm, Dunmore Home Farm; Parade Stands—Mr Paton, Braehad; Gates—Mr M'Hutchen Dobbie, Campend; Implements—Mr Middleton, *Veterinary Surgeon.*—On the motion of Mr MALCOLM, seconded by Mr ANDERSON, Mr John M. Stewart, M.R.C.V.S., Stirling, was unanimously appointed Veterinary Inspector for the Stirling Show, on the usual conditions.

*Stirling Agricultural Society.*—It was resolved to grant facilities in the Highland Show for awarding the Shorthorn Society's district £10 prize for Yearling Shorthorn bulls, and also the prizes for Yearling Clydesdale colts and fillies in the "Derby" classes of the Stirlingshire Agricultural Society, it being understood that all the animals competing for these prizes must be entered in the ordinary classes of the Highland Society.

*Judges.*—The Judges were appointed in Committee at the close of the meeting.

*Clipping of Blackface Sheep.*

The Standing Orders having been suspended, Mr CHARLES HOWATSON moved the following resolution: "That the Board appoint the following Committee to consider and report on the present system of wintering Blackface Rams, with the view of assisting the Board in any action it may be disposed to take with regard to regulations for the clipping of Blackface Sheep at the Shows of the Society—viz., Mr C. Howatson of Glenbuck (Convener); Mr Alex. Cross of Knockdon; Mr C. H. Scott Plummer of Sunderland Hall; Dr R. Shirra Gibb, Boon; Mr Charles Douglas of Auchloch; Mr M. Hamilton, Woolfords; Mr James Clark, Crossflatt; Mr Robert MacMillan, Woodlea; Mr Gavin Hamilton, Banker, Lesmahagow; and Colonel Mackenzie of Edenbarnet."

Mr HUTCHESON seconded, and the motion was unanimously adopted.

*Cawdor Cup.*

The SECRETARY submitted a letter from the Secretary of the Clydesdale Horse Society conveying a copy of the regulations attached to the new Cawdor Challenge Cup to be awarded for the best Clydesdale Female at the Stirling Show.

It was explained that the conditions provided for the veterinary inspection of animals competing for the Cup.

Mr MALCOLM moved that the animals be inspected by the Society's Veterinary Surgeon. Dr WILSON seconded.

Dr GILLESPIE moved that the veterinary inspection of the animals be left to the Clydesdale Horse Society. Sir JOHN MACPHERSON-GRANT seconded.

On a show of hands being taken, Dr Gillespie's amendment was carried by 22 to 7. The regulations attaching to the Cup were thereupon agreed to.

*Inverness Show, 1911.*

Sir JOHN MACPHERSON-GRANT moved as follows: "That provided a suitable site is available, and satisfactory financial and other arrangements can be made, the Society's Show of 1911 be held in the Inverness District."

The resolution was unanimously agreed to.

*Fertilisers and Feeding-Stuffs Act.*

The SECRETARY submitted a report from the County Council of Berwickshire on Analyses of Manures and Feeding-Stuffs made in that county during 1908. One sample showed serious deficiencies, but no action could be taken on account of the conditions of the Act not having been fully observed in the taking of samples.

*British Dairymaids' Association.*

A letter was submitted from the secretary of the British Dairymaids' Association making application for a Gold and Silver Medal for the first and second prize-winners at the Annual Champion Butter-Making Competition to be held by that Association.

On the motion of Mr SPEIR the application was granted, a minor Gold Medal to be given for the first winner and a medium Silver Medal for the second.

*Milk Records.*

On the recommendation of the Milk Records Committee it was resolved that a sum of £200 be placed at the disposal of the Milk Records Committee for the current year to be employed at its discretion in aid of the Milk Records to be conducted under the management of the Ayrshire Cattle Herd-Book Society.

*Strathearn Agricultural Society Centenary Show.*

It was resolved that a sum of £25 be voted in aid of the prize fund for the Centenary Show of the Strathearn Agricultural Society, to be held at Crieff next summer.

## PROCEEDINGS AT GENERAL MEETINGS.

### GENERAL MEETING, 6TH JUNE 1908.

Mr ALEX. CROSS of Knockdon in the chair.

#### *New Members.*

164 candidates were balloted for and duly elected.

#### *Election of Office-Bearers.*

The following office-bearers of the Society were elected for the ensuing year:—

*President*—His Grace the Duke of Montrose, K.T.

*Vice-Presidents*—The Earl of Mar and Kellie; Lord Balfour of Burleigh; Colonel Drummond of Blairdrummond; Captain Clayhills Henderson of Invergowrie, R.N.

*Ordinary Directors*—Messrs John M'Hutchen Dobbie, Campend, Dalkeith; William Taylor, Park Mains, Renfrew; David Wilson, D.Sc., of Carbeth; W. S. Ferguson, Pictatonhill, Perth; Hugh M. Leadbetter, Legerwood, Earliston; T. Gordon Duff of Drummuir, Keith; Sir John Macpherson-Grant of Ballindalloch, Bart.; Colonel Dudgeon of Cargen, Dumfries.

*Extraordinary Directors*—Messrs James Thomson, Provost of Stirling; Captain Stirling of Keir, Dunblane; Captain C. Home Graham Stirling of Strowan, Tomperran, Comrie; John J. Moubray of Naemoor, Rumbling Bridge; R. C. Mackenzie of Edenbarnet, Duntocher; John Edmond of Galamuir, Bannockburn; John Craig, Innergeldie, Comrie; J. J. Stirling of Kippendavie, Dunblane; James Kemp Smith, Stirling; Parlan Macfarlan, Faslane, Gareloch; William T. Malcolm, Dunmore, Larbert; Dr R. Shirra Gibb, Boon, Lauder; Andrew Hutcheson, Beechwood, Perth; John Speir, Newton Farm, Newton, Glasgow; Jonathan Middleton, Glastullich, Nigg, Ross-shire; James Hope, East Barnes, Dunbar; Charles Howatson of Glenbuck; W. J. H. Maxwell of Munches, Dalbeattie; E. Hedley Smith, B.L., Whittingehame, Prestonkirk; R. Paterson, Mill of Drip, Stirling.

#### *Aberdeen Show, 1908.*

Colonel M'INROY, in the absence of Mr A. M. Gordon of Newton, convener of the Local Committee, reported on the arrangements for the Show to be held at Aberdeen on Tuesday 21st July, and three following days. As in former years at Aberdeen, the Show will take place on the Links, the use of which, along with a supply of water, had been granted free of charge by the town of Aberdeen. The town had, in addition, given a donation of £100 to the funds of the Show. Liberal subscriptions raised by voluntary assessments on owners of lands and heritages were also being given by the County Councils of Aberdeen, Banff, Kincardine, and Forfar (Eastern Division). There was every reason to expect that, as usual at Aberdeen, the Show would be large and in every way successful, if only the weather should be favourable.

#### *Stirling Show, 1909.*

Mr A. H. ANDERSON, in the absence of Dr Wilson, reported that the arrangements for the Stirling Show of 1909 are progressing satisfactorily. The Show will take place in the King's Park on Tuesday, 20th July, and three following days.

*Dumfries Show, 1910.*

Mr AND. HUTCHESON reported that progress was being made with the arrangements for the Show of 1910, to be held in the Dumfries district. He understood a good site near the station would be got. The counties interested had agreed to make a voluntary assessment in aid of the Show.

*Education.*

Mr JOHN SPERIE submitted the usual reports on the results of the examinations held this year for the National Diploma in Agriculture, and for the Society's Certificates in forestry. For the National Diploma in Agriculture the number of candidates was larger than in any former year, the total having been 102.

*Science Department.*

Mr JAMES HENDRICK, chemist to the Society, reported on the work of the Science Committee during 1908.

He explained that the manure and mutton experiments have entered into a new phase. A report on these experiments to the end of last season is published in the current volume of the 'Transactions.' It was at first intended to discontinue the experiments after the season 1907, but it was found that such valuable results were still being obtained from certain of the plots that it was decided to give a dressing of basic slag to the plot at each centre on which cake was fed, and to continue the experiments for another period. The new dressing of slag was applied early this spring, and the experiments are now in progress for the present season.

*Botanical Report.*

The following report by Professor M'ALPINE, botanist to the Society, was submitted: I have the honour to report that during this season I have examined 246 samples of grass and clover seeds. The purity of the seeds was, as a rule, very high, except in the case of burnet, which often contained over 30 per cent of sainfoin.

The following table shows the maximum and minimum percentages of germination:—

Grasses.	Maximum germination per cent.	Minimum germination per cent.
Meadow foxtail . . . . .	94	80
Tall oat grass . . . . .	90	73
Crested dogtail . . . . .	94	89
Cocksfoot . . . . .	97	80
Hard fescue . . . . .	94	90
Tall fescue . . . . .	96	90
Meadow fescue . . . . .	97	78
Italian ryegrass . . . . .	99	86
Perennial ryegrass . . . . .	100	86
Timothy . . . . .	99	70
Rough-stalked meadow grass . . . . .	95	90
Clovers.		
Kidney vetch . . . . .	97	90
Alsike clover . . . . .	99	89
Red clover . . . . .	97	79
White clover . . . . .	98	83
Trefoil clover . . . . .	100	89
Miscellaneous Plants.		
Chicory . . . . .	80	75
Burnet . . . . .	91	85

Colonel M'INROY raised the question as to whether the names of the firms, alike in the chemical and botanical departments, whose goods were reported on by the chemist and botanist, should not be published.

Mr JOHN SPERIE explained that there had always been great difficulty in that connection. They had not been able to obtain information from farmers who sent in samples which would warrant the Society in publishing the names of the firms.

*Access to Mountains Bill.*

The CHAIRMAN intimated that at the Meeting of Directors held that day the question of watching the Access to Mountains Bill in the interest of tenant farmers had been considered, and a Committee had been appointed to watch the measure as it passed through Parliament, and take whatever steps might be necessary to conserve the interest of tenants.

Mr ANDREW HUTCHESON supported the proposal, and the Meeting approved of the action taken in regard to the Bill.

The usual votes of thanks terminated the proceedings.

GENERAL MEETING IN THE SHOWYARD AT ABERDEEN,  
22ND JULY 1908.

In the absence of the President (the Duke of Richmond and Gordon), Mr A. M. GORDON of Newton, Convener of the Local Committee, presided.

The Rev. Dr GILLESPIE moved—"That the cordial thanks of the Society be given to the Lord Provost, Magistrates, and Town Council of Aberdeen for their assistance and co-operation in furthering the success of the Show, and especially for their donation of £100 towards the funds of the Show, and for the use of the Links for the Showyard, as well as for a supply of water free of charge. At no place did the Society receive a more cordial or more liberal reception than at Aberdeen."

Mr JAMES HOPE, East Barnes, Dunbar, in seconding the motion, said it had always been a pleasure to the Society to come to Aberdeen.

The motion was adopted.

Mr ALEXANDER CROSS of Knockdon moved a vote of thanks to the subscribers to the local fund. In this respect they were well served in Aberdeen.

Dr WILSON of Carbeth seconded the motion, which was agreed to.

Mr SCOTT PLUMMER of Sunderland Hall, Selkirk, moved a vote of thanks to Mr Gordon of Newton, Convener, and the other members of the Local Committee, for their admirable arrangements for the Show.

Captain GILMOUR seconded the motion, which was adopted.

The CHAIRMAN, in acknowledging the vote, expressed the regret that the members felt at the absence of their President, the Duke of Richmond and Gordon, and he hoped his Grace's health would speedily improve. It was very little the Local Committee had to do. That was the third occasion on which he had acted as Convener of the Local Committee at Aberdeen, and on every occasion, such was the zeal, efficiency, and precision with which Mr Macdonald and his staff discharged their work connected with the Show, that the labours of the Local Committee were very easily overtaken. He called for three hearty cheers for Mr Macdonald and his staff.

Mr MACDONALD acknowledged the compliment.

The CHAIRMAN intimated that a petition had been got up by a good many agricultural associations in Scotland to present to Lord Carrington, the President of the Board of Agriculture and Fisheries, in connection with the marking of foreign meat, and that a copy had been sent to be signed on behalf of the Highland and Agricultural Society.

The CHIEF-CLERK (Mr John Macdiarmid) read the petition, which stated that grave injustice was being done to breeders and feeders of stock, as well as to the general public, by the sale of foreign meat as the produce of this country. Traders of foreign meat had formed themselves into a trust to regulate the price of such in the foreign market, with the result that the price of foreign meat, although of acknowledged inferior quality, has been raised to practically the same as that of the home product. Retailers also did harm, the petition stated, by failing to make any distinction between home and foreign product. All imported beef, mutton, or pork, whether brought in alive or as carcases, should be marked as foreign in such a way as to clearly distinguish it from the home product. The petitioners therefore asked Lord Carrington, after such inquiry as might be deemed necessary, to legislate, in order to give effect to their views.

Sir ALEXANDER BAIRD, Bart., of Urie, moved that the Chairman be authorised to sign the petition.

Mr ANDREW HUTCHESON, Beechwood, Perth, seconded. He said they held different views about the cattle trade, but he thought they were unanimous in desiring that the produce of their own country should be sold as home produce.

The motion was unanimously adopted.

The Rev. Dr GILLESPIE said the Secretary had reminded him that a resolution had been adopted by the Directors of the Society dealing with the whole question of foreign produce, and he moved that the Meeting approve of what the Directors had done.

Mr HUTCHESON seconded the motion, which was agreed to.

This concluded the business, and at the call of Mr HUTCHESON, the Chairman was cordially thanked for presiding.

### ANNIVERSARY GENERAL MEETING, 15TH JANUARY 1909.

Mr ALEX. CROSS of Knockdon presided.

#### *Finance.*

Rev. Dr GILLESPIE, Treasurer, laid on the table the volume of accounts for the year to 30th November 1908, as prepared by the Society's Auditor. The receipts for members' subscriptions for year amounted to £1691, being £133 less than last year, the reduction being entirely in life subscriptions. In annual subscriptions there is an increase over the previous year of £33. The income from invested funds was £3667, and the gross drawings from the Aberdeen Show, £8530. On the Aberdeen Show the balance to the good was £1881. Apart from the accounts of the Show, the receipts for the year exceed the outlays by £772, including £538 of life subscriptions. The total sum paid in premiums in the past year was £3026. In addition, the sum of £870 was expended in the departments of agricultural education, chemistry, botany, veterinary science, and in milk records.

#### *Argyll Naval Fund.*

Captain GILMOUR, yr. of Montrave, submitted the Accounts of the Argyll Naval Fund for 1907-8, which showed that the income for the year amounted to £230, 5s. 6d., while the expenditure was £200—in grants of £40 each to five naval cadets. No vacancy occurred during the year 1908 in the list of beneficiaries.

#### *Aberdeen Show, 1908.*

Mr WM. DUTHIE reported on the results of the Aberdeen Show. The weather was the most favourable experienced for nearly twenty years, the attendance of the public was large, and the balance of receipts over expenditure was larger than at any former Highland Show at Aberdeen. The sum offered by the Society in prizes exceeded that for the Aberdeen Show of 1894 by £519, yet the profit in 1908 amounted to £1881, as against £1670 in 1894. For this result the Society is mainly indebted to the cordial co-operation of the County Councils in the districts and of the Town Council of Aberdeen. The landed proprietors of the counties of Aberdeen, Banff, Kincardine, and Eastern Division of Forfarshire contributed £1145 to the funds of the Show, the City of Aberdeen giving £100. The display of live stock and implements was in every way highly creditable.

#### *Stirling Show, 1909.*

Dr WILSON, Convener of the Local Committee, reported on the arrangements for the Show of 1909, to be held at Stirling on Tuesday 20th July, and three following days. An excellent site will, as usual, be found in the King's Park. The County Councils of Stirling, Perth (Stirling Show Division), and Clackmannan have resolved to raise sums by voluntary assessments in aid of the Show, and it is expected that in Dumbartonshire a contribution will, as heretofore, be raised by private subscription. The town of Stirling had voted a subscription of £100, besides giving a supply of water free of charge. An exceptionally liberal list of prizes has been provided, the total sum offered in premiums being close on £3000, of which £2566 would be provided out of the Society's funds.

#### *Dumfries Show, 1910.*

Dr GILLESPIE reported that for the Show of 1910, to be held at Dumfries, an admirable site had been secured at Rotchell Park, where the Show took place on three former occasions. All the County Councils in the district had resolved to raise funds in aid of the Show by means of a voluntary assessment on owners of lands and heritages.

*Inverness Show, 1911.*

Sir JOHN MACPHERSON-GRANT moved that, provided a suitable site is obtained and satisfactory financial and other arrangements can be made, the Society's Show of 1911 be held in the Inverness Show District. Mr HUTCHESON seconded, and the motion was adopted.

*District Shows and Competitions.*

Mr JOHN MARR submitted the report on the district shows and competitions, showing that in 1908 grants of money and medals have been given to 287 districts. The total expenditure under this head amounted to £587. For the current year the Directors proposed the following grants: (1) Under Section 1, twenty districts for grants of £12 each for cattle, horses, and sheep, and fifteen districts in intermediate competition with a grant of three silver medals to each; (2) under Section 2, fourteen districts for grants of £15 each for stallions; special grants of £50 to the Agricultural Organisation Society for the development of the poultry industry in the Highlands; £40 for Highland home industries; £20 to Kilmarnock Cheese Show; £3 each to Orkney, East Mainland, Sanday, Gigha, and Walls and Hoy Agricultural Societies; twenty-three districts for two medals each; about 150 medals at ploughing competitions; and eleven districts for two medals each for cottages and gardens, making the total sum offered in 1909, £689. The recommendations were adopted.

*Various.*

The Society's Chemist, Mr HENDRICK, gave in his usual report upon analyses made for members during 1908.

Sir JOHN MACPHERSON-GRANT moved that the annual grant of £50 to the lecturer on forestry in the University of Edinburgh be continued for the current year. This was agreed to.

Dr GILLESPIE reported on the results of the examinations held last autumn for the National Diploma in Dairying. At the examination held in England there were thirty-one candidates, of whom nineteen obtained the diploma. At the examination held at Kilmarnock there were twenty-six candidates, of whom fifteen obtained the diploma. The names of the successful candidates at these examinations, as well as those who last year obtained the National Diploma in Agriculture, will be published in the next volume of 'Transactions.' He moved that the annual grant of £100 to the Scottish National Dairy School at Kilmarnock be continued for the current year. Mr C. DOUGLAS seconded, and it was agreed to.

Dr GILLESPIE reported that the Publications Committee had completed arrangements for the volume of 'Transactions' to be published in the approaching spring.



# APPENDIX

## PREMIUMS

OFFERED BY

### THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1909

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## GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have since been continuously directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purpose of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising the Society to grant Diplomas to Students of Agriculture; and by giving grants in aid of education in Agriculture and allied sciences. In 1900 the Society discontinued its own Examination, and instituted jointly with the Royal Agricultural Society of England an Examination for a National Diploma in Agriculture.

4. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise. Terminated in 1881 in accordance with arrangements with the Royal College of Veterinary Surgeons.

5. The institution of a National Examination in Dairying, jointly with the Royal Agricultural Society of England.

6. The institution of an Examination in Forestry for First and Second Class Certificates.

7. The appointment of a chemist for the purpose of promoting the application of science to agriculture.

8. The establishment of a Botanical Department.

9. The appointment of Entomologist to advise members regarding insect pests.

10. The annual publication of the 'Transactions,' comprehending papers by selected writers, Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

11. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society), to assist young natives of the Highlands who enter His Majesty's Navy.

## CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of the Royal Charters, referred to above, which authorise the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Supplementary Charter of 1856 provides for the appointment of a Council on Education, consisting of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society.

## PRIVILEGES OF MEMBERS

### MEMBERS OF THE SOCIETY ARE ENTITLED—

1. *To receive a free copy of the 'Transactions' annually.*
2. *To apply for District Premiums that may be offered.*
3. *To report Ploughing Matches for Medals that may be offered.*
4. *To Free Admission to the Shows of the Society.*
5. *To exhibit Live Stock and Implements at reduced rates.<sup>1</sup>*
6. *To have Manures and Feeding-Stuffs analysed at reduced fees.*
7. *To have Seeds tested at reduced fees.*
8. *To have Insect Pests and Diseases affecting Farm Crops inquired into.*
9. *To attend and vote at General Meetings of the Society.*
10. *To vote for the Election of Directors, &c., &c.*

### ANALYSIS OF MANURES AND FEEDING-STUFFS

The Fees of the Society's Chemist for Analyses made for Members of the Society shall, until further notice, be as follow:—

The estimation of one ingredient in a manure or feeding-stuff	5s.
The estimation of two or more ingredients in a manure or feeding-stuff	10s.

*These charges apply only to analyses made for the sole and private use of Members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.*

The Society's Chemist, if requested, also supplies valuations of manures, according to the Society's scale of units.

### SEEDS, CROP DISEASES, INSECT PESTS, &c.

The rates of charges for the examination of plants and seeds, crop diseases, insect pests, &c., will be had on application to the Secretary.

### ELECTION OF MEMBERS

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June. It is not necessary that the proposer should attend the Meeting.

### CONDITIONS OF MEMBERSHIP

*Higher Subscription.*—The ordinary annual subscription is £1, 3s. 6d., and the ordinary subscription for life-membership is £12, 12s.; or after ten annual payments have been made, £7, 7s.

*Lower Subscription.*—Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment of £7, 7s., and after eight annual payments of 10s. have been made, a Life Subscription may be purchased for £5, 5s., and after twelve such payments, for £3, 3s.<sup>2</sup> Subscriptions are payable on election, and afterwards annually in January.

Members are requested to send to the Secretary the names and addresses of Candidates they have to propose (stating whether the Candidates should be on the £1, 3s. 6d. or 10s. list).

JAMES MACDONALD, *Secretary.*

3 GEORGE IV. BRIDGE, EDINBURGH.

<sup>1</sup> Firms are not admitted as Members; but if one partner of a firm becomes a Member, the firm is allowed to exhibit at Members' rates.

<sup>2</sup> Candidates claiming to be on the 10s. list must state under which of the above designations they are entitled to be placed on it.

## ESTABLISHMENT FOR 1908-1909

### President.

THE DUKE OF MONTROSE, K.T., Buchanan Castle, Drymen.

### Vice-Presidents.

THE EARL OF MAR and KELLIE, Alloa House, Alloa.  
 LORD BALFOUR of BURLEIGH, K.T., Kennet, Alloa.  
 Colonel H. S. HOME DRUMMOND of Blair Drummond, Stirling.  
 Captain G. D. CLAYHILLS HENDERSON of Invergowrie, R.N., Dundee.

### Ordinary Directors.

Year of  
Election.

- |      |   |  |
|------|---|--|
|      | ( | Captain THOMAS HOPE of Bridge Castle, Westfield, Linlithgowshire.    |
|      |   | ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow.                |
|      |   | A. H. ANDERSON, Kippendavie Estate Office, Dunblane.                 |
| 1905 | { | MARQUIS OF TULLIBARDINE, M.V.O., D.S.O., Blair Castle, Blair Atholl. |
|      |   | ATHOLE S. HAY of Marlefield, Roxburgh.                               |
|      |   | JOHN M'CAIG, Challoch, Leswalt, Stranraer.                           |
|      |   | WILLIAM DUTHIE, Tarves, Aberdeenshire.                               |
|      |   | C. M. CAMERON, Balnakyle, Munlochry.                                 |
|      | ( | JAMES STENHOUSE, Turnhouse, Cramond Bridge.                          |
|      |   | W. S. PARK, Hatton, Bishopton.                                       |
|      |   | J. ERNEST KERR, Harviestoun Castle, Dollar.                          |
| 1906 |   | Major F. J. CARRUTHERS of Dormont, Lockerbie.                        |
|      |   | DAVID FERRIE, Parbroath, Cupar-Fife.                                 |
|      |   | E. DOUGLAS PATON, Braehead, St Boswells.                             |
|      |   | CHAS. E. N. LEITH HAY of Leith Hall, Kennethmont.                    |
|      |   | J. DOUGLAS FLETCHER of Rosehaugh, Avoch, R.S.O., Ross-shire.         |
|      |   | CHARLES DOUGLAS of Auchlochian, Lesmahagow.                          |
|      |   | Captain JOHN GILMOUR, yr. of Montrave, Woodburn, Ceres, Fife.        |
|      |   | JOHN MURRAY, Balruddery, Dundee.                                     |
| 1907 |   | Sir ARCHIBALD BUCHAN HEPBURN of Smeaton, Bart., Prestonkirk.         |
|      |   | JOHN MARR, Upper Mill, Tarves.                                       |
|      |   | JOHN M. AITKEN, Norwood, Lockerbie.                                  |
|      |   | JOHN CRAN, Kirkton, Bunchrew, Inverness.                             |
|      |   | C. H. SCOTT PLUMMER of Sunderland Hall, Selkirk.                     |
|      |   | JOHN M'HUTCHEN DOBBIE, Campend, Dalkeith.                            |
|      |   | WILLIAM TAYLOR, Park Mains, Renfrew.                                 |
|      |   | W. S. FERGUSON, Pictstonhill, Perth.                                 |
| 1908 |   | DAVID WILSON, D.Sc., of Carbeth, Killearn.                           |
|      |   | THOMAS GORDON DUFF of Drummur, Keith.                                |
|      |   | Colonel ROBERT F. DUDGEON of Cargen, Dumfries.                       |
|      |   | Sir JOHN MACPHERSON-GRANT of Ballindalloch, Bart.                    |
|      | ( | H. M. LEADBETTER, Legerwood, Earlstoun.                              |

## Extraordinary Directors.

- (JAMES THOMSON, Provost of Stirling.  
 Captain ARCHIBALD STIRLING of Keir, Dunblane.  
 Captain C. HOME GRAHAM STIRLING of Strowan, Tomperran, Comrie.  
 JOHN J. MOURRAY of Naemoor, Rumbling Bridge.  
 1908 Colonel R. C. MACKENZIE of Edinbarnet, Duntocher.  
 JOHN EDMOND of Galamuir, Bannockburn.  
 JOHN CRAIG, Innergeldie, Comrie.  
 J. J. STIRLING of Kippendavie, Dunblane.  
 JAMES KEMP SMITH, Scottish Central Works, Stirling.  
 (PARLAN MACFARLAN, Faslane, Gareloch, Dumbartonshire.  
 1905 WILLIAM T. MALCOLM, Dunmore, Larbert.  
 R. SHIERA GIBB, Boon, Lauder.  
 1906 } ANDREW HUTCHESON, Beechwood, Perth.  
 JOHN SPEIR, Newton Farm, Newton, Glasgow.  
 JONATHAN MIDDLETON, Glastullich, Nigg Station.  
 JAMES HOPE, East Barnes, Dunbar.  
 1907 } CHARLES HOWATSON of Glenbuck, Glenbuck.  
 W. J. H. MAXWELL of Munches, Dalbeattie.  
 E. HEDLEY SMITH, B.L., Whittingehame, Prestonkirk.  
 1908 ROBERT PATERSON, Hill of Drip, Stirling.

## Office-Beaters.

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ALEXANDER CROSS of Knockdon.

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- |                                     |                                     |
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JOHN WILSON, Chapelhill, 6 Mansionhouse Road, Edinburgh.  
JOHN M'HUTCHEN DOBBIE, Campend, Dalkeith.  
JOHN M'CAIG, Challock, Leswalt.  
C. H. SCOTT PLUMMER of Sunderland Hall, Selkirk.  
JAMES STENHOUSE, Turnhouse, Cramond Bridge.  
THOMAS GORDON DUFF of Drummuir, Keith.  
J. M. AITKEN, Norwood, Lockerbie.  
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CHARLES DOUGLAS of Auchlochan, Lesmahagow.  
JAMES HENDRICK, Chemist, *ex officio*.  
A. N. M'ALPINE, Botanist, *ex officio*.

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ANDREW HUTCHESON, Beechwood, Perth.  
Captain THOS. HOPE of Bridge Castle, Westfield.  
JAMES STENHOUSE, Turnhouse, Cramond Bridge.  
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 The SECRETARY.

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 THOMAS GORDON DUFF of Drummur, Keith.  
 The MARQUIS OF TULLIBARDINE, M.V.O., D.S.O., Blair Castle.  
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 Captain JOHN GILMOUR, yr. of Montrave, Woodburn, Ceres.  
 CHARLES DOUGLAS of Auchlochan, Lesmahagow.

**9. OFFICE-BEARERS.**

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 W. S. FERGUSON, Pictstonhill, Perth.  
 JOHN CRAN, Kirkton, Bunchrew, Inverness.  
 A. H. ANDERSON, Kippendavie, Dunblane.  
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 JOHN M'CAIG, Challock, Leswalt, Stranraer.  
 ALEX. M. GORDON of Newton, Inch, Aberdeenshire, *ex officio*.  
 ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow, *ex officio*.  
 Very Rev. JOHN GILLESPIE, LL.D., Mouswald Manse, Ruthwell, *ex officio*.

The President, Vice-Presidents, the Treasurer, Honorary Secretary, and Chairman of Directors are members *ex officio* of all Committees.

**REPRESENTATIVES ON OTHER BODIES.****National Agricultural Examination Board.**

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 JOHN SPIER, Newton Farm, Newton, Glasgow.  
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**West of Scotland Agricultural College.**

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 JOHN M. MARTIN, Crauford, Lasswade.

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**Aberdeen and North of Scotland College of Agriculture.**

T. GORDON DUFF of Drummuir, Keith.  
 WILLIAM DUTHIE, Tarves.

**Royal (Dick) Veterinary College.**

JOHN M. MARTIN, Crauford, Lasswade.

**Glasgow Veterinary College.**

ALEX. CROSS of Knockdon, 18 Hope Street, Glasgow.

**MEETINGS.**

**General Meetings.**—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held in the months of January and June, in the Society's Hall, 3 George IV. Bridge, for the election of Members and other business. Twenty a quorum.

By a resolution of the General Meeting on 15th January 1879, a General Meeting of Members is held in the Showyard on the occasion of the Annual Show. This year it will be held at Stirling, on Wednesday, 21st July, at an hour to be announced in the programme of the Show.

With reference to motions at General Meetings, Bye-Law No. 10 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

**General Show at Stirling.**—20th, 21st, 22nd, and 23rd July.—Entries close for Implements, 17th May; Stock, Poultry, and Dairy Produce, 11th June.

**Directors' Meetings.**—The Board of Directors meet (except when otherwise arranged) on the first Wednesday of each month from November till June inclusive, at half-past one o'clock P.M., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him. Seven a quorum.

**Committee Meetings.**—Meetings of the various Committees are held as required.

**Nomination of Directors.**—Meetings of Members, for the purpose of nominating Directors to represent the Show Districts on the Board for the year 1910-1911, will be held at the places and on the days after mentioned :—

#### Year 1910-1911.

- |  |                                 |
|--|---------------------------------|
| 1. Edinburgh, 3 George IV. Bridge, . . .       | Wed., 9th Feb. 1910, at 2.      |
| 2. Glasgow, North British Railway Hotel, . . . | Wed., 16th Feb. 1910, at 1.     |
| 3. Stirling, Golden Lion Hotel, . . .          | Thur., 17th Feb. 1910, at 1.30. |
| 4. Perth, Salutation Hotel, . . .              | Fri., 18th Feb. 1910, at 2.     |
| 5. Kelso, Ante-room, Corn Exchange, . . .      | Fri., 25th Feb. 1910, at 1.     |
| 6. Aberdeen, Imperial Hotel, . . .             | Fri., 4th Mar. 1910, at 2.30.   |
| 7. Inverness, Station Hotel, . . .             | Tues., 8th Mar. 1910, at 12.30. |
| 8. Dumfries, King's Arms Hotel, . . .          | Wed., 16th Mar. 1910, at 1.     |

The nomination of Proprietor or other Members paying the higher subscription must be made in the 3rd, 6th, 7th, and 8th Districts ; and the nomination of Tenant-Farmer or other Members paying the lower subscription, in the 1st, 2nd, 4th, and 5th Districts.

#### EXAMINATIONS.

**Agriculture.**—The Examination for 1909 for the National Diploma in Agriculture will be held at the University, Leeds, on Monday, 26th April, and following days. Entries close on 31st March.

**Forestry.**—The Examination for the Society's Certificates in Forestry will be held at 3 George IV. Bridge, Edinburgh, on 13th, 14th, and 15th April 1909. Entries close on 6th March.

**Dairy.**—The Examination for 1909 for the National Diploma in Dairying will be held at the Dairy School, Kilmarnock, on Saturday, 25th September, and following days. Entries close on 31st August.

## AGRICULTURAL EDUCATION

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

From 1858 to 1899 the Society held an annual Examination for Certificate and Diploma in Agriculture. In 1872 the Free Life Membership of the Society was granted to winners of the Diploma. In 1884 permission was given to holders of the Diploma to append the letters F.H.A.S. to their names.

In 1898 it was resolved by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland to discontinue the independent Examinations in Agriculture held by the two Societies, and to institute in their stead a Joint-Examination for a NATIONAL DIPLOMA IN AGRICULTURE (N.D.A.) This Examination is now conducted under the management of the "National Agricultural Examination Board" appointed by the two Societies. In the year 1903, on the invitation of the two Societies, the Board of Agriculture and the Scotch Education Department agreed to appoint a representative from each to act on the Examination Board. Professor Middleton represents the former and Mr John Struthers, C.B., the latter body.

### REGULATIONS AND SYLLABUS OF THE EXAMINATION FOR THE NATIONAL DIPLOMA IN THE SCIENCE AND PRACTICE OF AGRICULTURE.

#### REGULATIONS.

1. The Societies may hold conjointly, under the management of the National Agricultural Examination Board appointed by them, an annual Examination in the Science and Practice of Agriculture, at a convenient centre.

2. Candidates who pass the Examination will receive the National Diploma in Agriculture—the Diploma to be distinguished shortly by the letters "N.D.A."

3. The Examination will be conducted by means of written papers and oral Examinations.

4. The Examination must be taken in Two Parts as follows :—

<i>First Part.</i>	<i>Second Part.</i>
1. Agricultural Botany.	6. Practical Agriculture.
2. Mensuration and Land Surveying (or <i>Agricultural Book-keeping</i> ).	7. Agricultural Book-keeping (or <i>Mensuration and Land Surveying</i> ).
3. General Chemistry.	8. Agricultural Chemistry.
4. Geology.	9. Agricultural Engineering.
5. Agricultural Zoology.	10. Veterinary Science.

Candidates have the option of taking Mensuration and Land Surveying in the First Part and Agricultural Book-keeping in the Second Part, or of taking Agricultural Book-keeping in the First Part and Mensuration and Land Surveying in the Second Part. The choice must be declared on the Entry Form at the time of Entry for the First Part.

5. The maximum number of marks obtainable and the minimum number of marks in each subject qualifying for the Diploma will be as follows :—

*First Part—*

SUBJECT.	Max. No. of Marks.	Pass Marks for Diploma.
1. Agricultural Botany . . . . .	200	120
2. Mensuration and Land Surveying . . . . .	200	120
3. General Chemistry . . . . .	200	120
4. Geology . . . . .	100	50
5. Agricultural Zoology . . . . .	100	50

*Second Part—*

6. Practical Agriculture . . . . .	500	300
7. Agricultural Book-keeping . . . . .	200	120
8. Agricultural Chemistry . . . . .	200	120
9. Agricultural Engineering . . . . .	200	100
10. Veterinary Science . . . . .	100	50

6. A Candidate who obtains not less than three-fourths (1500) of the aggregate maximum marks (2000) in the entire Examination will receive the Diploma with Honours, provided that he obtains not less than three-fourths (375) of the maximum marks (500) in the subject of Practical Agriculture.

7. A Candidate will not be entitled to take both Parts of the Examination at one time. A year at least must elapse between the passing of the First Part and sitting for the Second Part; and the Second Part must, except with the special permission of the Board, be taken within two years of the passing of the First Part.

8. A non-returnable fee of £1 will be required from each Candidate for each Part of the Examination.

9. A Candidate who fails to obtain Pass marks in any of the subjects in Part I. must take the entire Part again. A Candidate who fails to obtain Pass marks in more than one of the subjects in Part II. must take the entire Part again. A Candidate who fails in one subject only in Part II. may come up again for that subject alone.

10. Holders of the First Class Certificate of the Royal Agricultural Society of England and of the Diploma of the Highland and Agricultural Society of Scotland will not be eligible for this Examination.

11. The Board reserve the right to postpone, abandon, or in any way, or at any time, modify an Examination, and also to decline at any stage to admit any particular Candidate to the Examination.

The Tenth Examination for the National Diploma in Agriculture will take place at the Leeds University, on Monday, 26th April 1909, and following days. Forms of application for permission to sit at the Examination may be obtained in due course from the Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W.C., or from the Secretary, Highland and Agricultural Society of Scotland, 3 George IV. Bridge, Edinburgh, and must be returned duly filled up not later than Tuesday, 31st March 1909, when the Entries will close.

16 BEDFORD SQUARE, LONDON, W.C.,  
January 1909.

## SYLLABUS OF SUBJECTS OF EXAMINATION.

### FIRST PART.

#### I.—AGRICULTURAL BOTANY.

1. *Morphology*.—The structure of plants. The principles of classification. The Natural Orders (Phanerogams and Cryptogams), dealing specially with those of importance to the Agriculturist.

2. *Physiology*.—The life of the plant. Organs and their functions—nutritive and reproductive.

3. *Pathology*.—Diseases of plants, and their causes. Parasites—Phanerogams, Fungi, Bacteria. Prevention and cure.

4. *Cultivation*.—Conditions in plant life favourable to (a) the improvements of cultivated plants, and (b) the destruction of weeds. New varieties of plants. Pastures. Pruning.

N.B.—Candidates will be expected to give evidence of practical acquaintance with the subject. They will be required to identify and briefly describe the commoner farm plants, such as cereals, roots, grasses, and clovers, as well as the more frequently occurring weeds, commercial examples of the chief farm seeds, sections illustrative of the main structural features of flowering plants, and slides of common fungi.

#### II.—MENSURATION AND LAND SURVEYING.

1. Ordinary rules of superficial and solid mensuration. Volume of a prismoid. Applications to practical questions. Estimation of weights of bodies whose dimensions and specific gravity are known.

2. Land surveying by chain. Plotting from field-book, and determination of areas surveyed. The simpler "field problems."

3. The use and adjustment of instruments employed in Surveying and Levelling.

4. Levelling and plotting from field-book.

5. A sufficient knowledge of Trigonometrical Surveying for the determination of heights and distances by Theodolite; as essential to this, solution of plane triangles by the aid of Logarithmic Tables.

6. A knowledge of the various classes of maps published by the Ordnance Survey Department and their Scales.

N.B.—Each candidate should have with him at the Examination a pair of compasses, scales of equal parts, including a scale of one chain to an inch, and the scale fitting the Ordnance map,  $\frac{1}{2500}$ , or 25·344 inches to the mile, a small protractor, a set square, and a straight-edge about 18 inches in length.

## III.—GENERAL CHEMISTRY.

## CHEMICAL PHYSICS.

**Matter and Energy**—Pure and mixed matter—Methods of separating Mixtures—Simple and Compound substances—Kinetic and Potential energy—Transformation and Conservation of Energy.

The solid, liquid, and gaseous states of matter and the phenomena accompanying change of state.

**Heat**—the measurement of Heat—thermometers—calorimeter—the effects of Heat and pressure on Gases.

Gaseous diffusion—vapour tension—the barometer.

**Mass and Weight**—the balance—Specific Gravity—Density—Hydrometry.

Metric system of weights and measures.

## INORGANIC CHEMISTRY.

The chief elements found in the commonest forms of matter.

The atomic theory—molecular condition of matter—atomic and molecular weights.

Chemical combination—symbolic notation—equations.

**Hydrogen**—its compounds with chlorine, oxygen, nitrogen, and carbon.

**Oxygen**—oxidation—combustion—respiration.

**Water**—natural waters—their impurities and purification.

**Acids**—bases—salts.

**Carbon**—its compounds with oxygen, sulphur, and nitrogen.

**Nitrogen**—nitric acid—nitrates—and nitrites.

**Sulphur**—sulphides—sulphuric and sulphurous acids—sulphates.

**Chlorine**—Bromine—Iodine.

**Chlorides**—Chlorates—chloride of lime, bleaching.

**Phosphorus**—phosphates—superphosphate.

**Silica**—silicates—arsenic.

**Metals**—ores—general metallurgic processes.

**Alkalies**—Chief Alkaline salts—Alkalimetry—Acidimetry.

**Lime**—the chief Lime compounds.

**Magnesium, Zinc, Iron, Lead, Copper, Mercury, Silver,** and their technically important Salts.

## ORGANIC CHEMISTRY.

**Distillation of Coal and Wood**—Nature of chief products.

**Hydrocarbons**—Paraffins—Olefines and their chief oxidation products—Alcohols, Aldehydes, Acids.

**Fermentations**—Alcoholic, acetic, lactic, butyric.

**Carbohydrates**—sugars, starch, cellulose, dextrine, gums.

**Fats**—glycerol—saponification.

**Benzene**—Phenol.

**Tartaric, Citric,** and other common vegetable acids.

**Amines and Amides**—urea.

**Proteids, Peptones, Gelatine,** &c.

*N.B.—In this section exact knowledge of general principles and typical compounds is expected, rather than diffuse information. Candidates are required to bring their Laboratory Notes to the Oral Examination in this subject.*

## IV.—GEOLOGY.

1. Chief minerals entering into the composition of rocks. Origin and composition of aqueous and igneous rocks. General principles of the classification of rocks. Leading divisions of the stratified rocks, and their geographical distribution in the British Islands.

2. Stratification, cleavage, and faulting of rocks.

3. Influence of the geological structure of a country on the configuration of the land and the composition of the soil. Relation of strata to water-supply and drainage. Origin of springs.

4. The various mineral manures, their sources, characters, and mode of occurrence.

5. Different kinds of building-stones and road materials. Distribution of the various economical substances.

N.B.—*Candidates will be required to name and describe common rocks, minerals, and fossils, and to show some knowledge of geological maps and sections.*

## V.—AGRICULTURAL ZOOLOGY.

1. The part played by common animals in helping or hindering agricultural operations, as illustrated by moles and voles, insectivorous and other birds, snails and slugs, useful and injurious insects, arachnids and myriopods, earthworms, &c.

2. *General Structure of Insects*, especially the external characters.

3. *Life-history of Insects*.—Various forms of larvæ. Economic importance of different stages.

4. *Classification of Insects*.—The general characters of the following Natural Orders: Coleoptera, Lepidoptera, Hymenoptera, Diptera, Hemiptera, Orthoptera, Neuroptera.

5. *Acarina* injurious to Food Crops and Live Stock.

6. *Parasitic Worms*.—Flukes, Tapeworms, and Threadworms.

7. *Preventive and Remedial measures* in regard to insects, acarines, and worm Parasites—e.g., farm practice in relation to the discouragement of Insect Attack. Encouragement of insect-eating birds and mammals. Artificial remedies. Insecticides. Treatment for Parasites.

N.B.—*Practical acquaintance with common animals, especially insects and worm parasites, will be expected. Where the Candidate is not acquainted with the scientific name of an animal, the generally received English name will be accepted.*

## SECOND PART.

## VI.—PRACTICAL AGRICULTURE.

1. *Soils*.—Classification of soils—characters and composition—suitability for cultivation.

2. *Improvement of Soil*.—Drainage, Irrigation, and Warping. The application of lime—marl—clay—ashes, &c.

3. *Rotations*.—The principles of rotations—rotations suitable for different soils and climates—systems of farming.

4. *Manures*.—The properties of manures—general and special—amounts used per acre—period and mode of application—treatment and disposal of sewage.

5. *Food-stuffs*.—The properties of feeding substances—their suitability

for different classes of farm stock—considerations affecting their use—rations for different classes of stock.

6. *Crops*.—Farm crops (cereals, agricultural grasses and clovers, forage plants and roots). How they grow—their cultivation, including cleaning, harvesting, and storage—diseases—insect injuries and remedies.

7. *Weeds and Parasitic Plants*.—Best methods of eradication.

8. *Pests of the Farm*.—Injuries to crops and live stock of the farm due to mammals, birds, and insects, with their prevention and remedies.

9. *Weather*.—Meteorology, or the effect of climate on farming conditions.

10. *Live Stock*.—The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, pigs, and poultry—their characteristics—the districts where they are generally met with.

11. *Milk*.—The production and treatment of milk—the manufacture of cheese, butter, &c.—the utilisation of bye-products.

12. *Machinery*.—The uses and prices of the machines and implements used in farming in different parts of Great Britain.

13. *Buildings*.—Buildings required on different classes of farms in various districts.

14. *Farming Capital*.—Calculations of the cost of stocking and working arable, stock, and dairy farms. Farm valuations. Rent, taxes, and cost of labour.

N.B.—*It is essential that a Candidate know his subject practically, and that he satisfy the Examiner of his familiarity with farm routine. Candidates will be expected to illustrate their answers when necessary by intelligible sketches or diagrams.*

## VII.—AGRICULTURAL BOOK-KEEPING.

1. Agricultural Book-keeping—Description of books to be kept, with examples.

2. Valuation of stock and effects.

3. Profit and Loss, and Balance-Sheet.

## VIII.—AGRICULTURAL CHEMISTRY.

1. *Soil*.—The origin, formation, and classification of soils. The constituents of soils. The supply of plant-food by the soil. The chemical and physical properties of soils of different kinds. The adaptation of soils to particular crops. The relations of air and water to soils. Nitrification and the biology of the soil. The chemical and physical effects of tillage operations and drainage. The improvement of soils. Causes of infertility. Mechanical and chemical analysis of soils.

2. *Plant-life*.—The constituents of plants. The relations of atmosphere, rainfall, heat, and light to vegetation. The sources of plant-food.

3. *Manures*.—The supply of plant-food by manure. The improvement of the soil by manuring. The classification of manures as regards their composition, nature, and use. The manures in general use upon the farm. Farmyard manure and other natural manures. Green-manuring. Liming, marling, claying. Artificial manures, their origin and manufacture. The changes which manures undergo in the soil. The influence of drainage. The application of manures. The analysis of manures. The adulteration of manures.

4. *Crops*.—The composition of the principal farm crops. Characteristics of particular kinds of crops. The influence of climate and season. The manuring of particular crops. The changes that take place in crops during the various stages of their growth. Rotation of crops.

5. *Foods*.—The constituents of foods, and their functions. The nutritive

value and digestibility of foods. The chemical composition and use of the principal feeding-stuffs employed on the farm, and the sources of their supply. The main facts regarding respiration and digestion. The relation of foods to the production of work, meat, milk, and manure. The adaptation of foods to special requirements. The residual manurial value of foods, and the circumstances affecting it. The estimation of un-exhausted fertility. Analysis and adulteration of foods.

6. *Water*.—Rain-water. Hard and soft waters. Drinking waters. Irrigation and sewage.

7. *Dairying*.—The composition of milk, and the conditions which influence its quality and supply. Cream and cream-separation. Butter and butter-making. Cheese and cheese-making. The influence of ferments on milk and milk products. The preservation of milk. Milk-testing.

N.B.—*Candidates are required to bring their Laboratory Notes to the Oral Examination in this subject.*

## IX.—AGRICULTURAL ENGINEERING.

1. *Heat*.—Specific heat; latent heat; the unit of heat. Total heat of water; as ice, water, and steam. Conduction, convection, and radiation of heat. Mechanical equivalent of heat. Principle of combustion. Quantity of heat generated by combustion. Modes of transforming heat of combustion into power, as in the steam-engine, and in gas and oil engines.

2. *Air*.—Properties of air; elasticity, density. Barometer. Moisture. Movement. Winds. Windmills.

3. *Water*.—Composition, impurities, weight. Height of column to balance atmosphere. Flow of water. Friction of water in pipes and channels. Usual speed of flow. Power derived from falls of water. Water-wheels; turbines; water-pressure engines; pumps. Potable water. Sources of supply. Means of purification. Storage.

4. *Mechanics*.—Centre of gravity; stability of structures. The lever; toothed wheels; pulleys and ropes; wrapping connectors; winches; differential pulleys. Laws of motion. Strength of materials, tensile, compressive, torsional, and transverse; elastic limit; ultimate strength. Horse-power; animal and human power. Friction of surfaces and axles; lubrication.

5. *Steam-engine*.—Construction of an ordinary portable-engine boiler, and of a Cornish boiler, and its setting. Fittings of a boiler. Construction of the stationary and portable steam-engine. Single cylinder. Double cylinder. Compound. Steam and fuel consumed per horse-power.

6. *Gas and Petroleum Engines*.—Principle of action. Sources of loss. Fuel and water required per horse-power.

7. *Electrical Generators, Motors, and Conductors*.—Principles of action. Losses in electrical machinery. Efficiency. Detection of faults. Use of fuses and cut-outs. Horse-power of motors. Ohm's law.

8. *Construction of Agricultural Implements*.—The mode of action and the general principles involved in the construction of farm implements. The adjustments of implements for different descriptions of work. Lubrication. Working or wearing parts.

9. *Cultivating Implements worked by Steam Power*.

10. *Horse-cultivating Implements*.—Ploughs. Cultivators or Grubbers. Harrows. Rollers. Scrubbers, &c.

11. *Sowing Implements*.—Drills. Manure and water drills. Broadcast barrows. Broadcasters. Manure distributors. Potato planters, &c.

12. *Hoeing Implements*.—Horse-hoes. Scufflers.

13. *Securing of Crops*.—Reaping machines. Mowing machines. Hay-makers. Horse-rakes. Elevators. Silage appliances. Potato raisers, &c.

14. *Carriages*.—Carts. Waggon. Motor Waggon. Sleighs. Rick-lifters, &c.

15. *Preparing Crops for Market*.—Threshing machines. Winnowing machines. Corn screens. Hummellers. Hay and straw presses, &c.

16. *Preparing Foods*.—Mills. Chaff-cutters. Pulpers. Turnip-cutters. Cake-breakers. Cooking apparatus.

17. *Dairy Appliances*.—Cream separators. Churns. Butter-workers. Cheese tubs. Curd mills. Cheese presses. Setting-pans. Refrigerators, &c.

18. *Land Improvement*.—Drainage instruments. Limekilns. Arrangements of shafting, pulleys, clutches, &c., for farm machinery at home-steads. Building construction and material.

N.B.—*Marks will be given for neatness and accuracy of Drawing.*

## X.—VETERINARY SCIENCE.

1. Anatomy and Physiology, including the comparative anatomy of the bones of the animals of the farm, and the structure and functions of the different organs and tissues of the horse, ox, sheep, and pig.

2. The digestive processes and principles of nutrition in the above animals.

3. A general knowledge of the blood and its circulation, and the processes of respiration, secretion, and excretion.

4. The physiology of reproduction, and its bearings on healthy breeding.

5. The period of gestation in the mare, cow, ewe, and sow, and the special management of these animals prior to, at the time of, and after parturition.

6. The management of farm stock in health and disease.

The following won the Diploma in 1908 :—

### *Diploma with Honours.*

1. JOHN DUNLOP, Glasgow and West of Scotland Agricultural College.
2. WILLIAM DODS DAVIDSON, Royal College of Science, Dublin.
3. ALEXANDER MANSON, Aberdeen and North of Scotland Agricultural College.
4. RENWICK HUTSON LEITCH, Glasgow and West of Scotland Agricultural College.

### *Diploma Winners (in alphabetical order).*

JOHN ABERNETHY, Aberdeen University.

LAURENCE ALFRED CHAPMAN, Armstrong College, Newcastle-upon-Tyne.

JOHN DUNCAN DAVIDSON, Royal College of Science, Dublin.

SAMUEL WESLEY DEAKIN, Harris Institute, Preston.

REGINALD NORMAN DOWLING, South-Eastern Agricultural College, Wye, Kent.

GEORGE FENOULHET, South-Eastern Agricultural College, Wye, Kent.

JAMES WATT FRASER, Aberdeen and North of Scotland Agricultural College.

HENRY JAMES HARGRAVES, Leeds University.

JOHN HARVEY-LOUITT, Aberdeen and Leeds Universities.

JOHN WILLIAM HOLZAPFEL, Armstrong College, Newcastle-upon-Tyne.

NORMAN BENTLEY HYDE, Harris Institute, Preston.

ERNEST JAMES INGLEBY, Leeds University.

JAMES PALLET LANCASHIRE, University College of Wales, Aberystwyth.

THOMAS LIMOND, Glasgow and West of Scotland Agricultural College.

PETER ANDREW M'WILLIAM, Glasgow and West of Scotland Agricultural College.

FRANCIS METCALFE, Harris Institute, Preston.

REES PRICE, University College of Wales, Aberystwyth.

FREDERICK JOHN RICHARDS, University College, Reading.

JAMES BARRY RIGGOTT, Midland Agricultural and Dairy College, Kingston, Derby.

THOMAS SIDNEY RUDKIN, Leeds University.

WILFRID GEORGE SANDEMAN, Glasgow and West of Scotland Agricultural College.

FRANK A. SMITH, Aberdeen and North of Scotland Agricultural College.

ARTHUR STEPHEN, Aberdeen and North of Scotland Agricultural College.

NOEL CROWTHER VIEHOFF, Harris Institute, Preston.

FREDERICK WHITE, Leeds University.

#### EXAMINATION PAPERS OF PAST YEARS.

Copies of the Papers set at the Annual Examinations for the National Diploma in the Science and Practice of Agriculture held from 1900 to 1908 may, as far as available, be had on application. Price 6d. per set.

## VETERINARY DEPARTMENT

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become Members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of Students who passed for the Society's Certificate is 1183.

The Society votes annually eleven silver medals for Class Competition to each of the two Veterinary Colleges in Scotland, the one in Edinburgh and the other in Glasgow.

## FORESTRY DEPARTMENT

THE Society grants FIRST and SECOND CLASS CERTIFICATES in FORESTRY.

1. An Examination will be held each year about the month of April.
2. Next Examination will be held on 13th, 14th, and 15th April 1909. Entries close on 6th March.
3. Candidates must possess—1. A thorough acquaintance with the theory and practice of Forestry. 2. A general knowledge of the following branches of study, so far as these apply to Forestry: (a) The Elements of Botany and Forest Zoology; (b) The Elements of Physics, Chemistry, and Meteorology; (c) Forest Engineering, including Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, road-making, and saw-mills; and Implements of Forestry; (d) Book-keeping and Accounts.

4. The examinations are open to candidates of any age, may be both written and oral, and will include such practical tests as may from time to time be decided to apply.

5. The maximum number of marks for each subject is 100; Pass marks for First-Class Certificate—Forestry, 75; all other subjects, 60. Pass marks for Second-Class Certificate—Forestry, 60; all other subjects, 50.

6. A Candidate who obtains Pass marks in certain subjects, but fails in others, may come up for these other subjects alone, it being understood that without the special permission of the Society no Candidate will be eligible to enter for more than two subsequent examinations.

7. A Candidate who has obtained the Second-Class Certificate may enter again for the First-Class Certificate.

The list of students who obtained certificates prior to 1899 appears in the 'Transactions,' Fifth Series, vol. xi. (1899).

The following have since obtained First-Class Certificates:—

ERIC ARTHUR NOBBS, Department of Agriculture, Cape Town, . . . . .	1899
GEORGE POTTS, Grey College, Bloemfontein, Orange River Colony, . . . . .	1899
DUNCAN S. RABAGLIATI, 1 St Paul's Road, Bradford, . . . . .	1901
FRANK SCOTT, Dumfries House Mains, Cumnock, . . . . .	1903
WILLIAM T. STOCKLEY, Rose Villa, Garswood, near Wigan, . . . . .	1906
A. FRANK WILSON, C.D.A. (Edin.), Reedieleys, Auchtermuchty, . . . . .	1907

The following have since obtained Second-Class Certificates:—

WILLIAM BRUCE, B.Sc., East of Scotland College of Agriculture, Edinburgh, . . . . .	1901
RAJAPPIER SWAMINATHAN, 56 Jesus Lane, Cambridge, . . . . .	1901
THOMAS USHER, Courthill, Hawick, . . . . .	1901
ALEXANDER MITCHELL, Braidwood, Gorebridge, . . . . .	1903
ALLAN CARRUTH, Lawmarnock, Kilbrachan, . . . . .	1905
ALEX. M. LUMSDEN, Newburn Schoolhouse, Upper Largo, . . . . .	1905
ROBERT M. WILSON, Laws Cottage, Duns, . . . . .	1905
THOMAS CAMPBELL, Greystoke, Penrith, . . . . .	1906
DONALD FERGUSON, Quarry Lane, Lennoxton, . . . . .	1906
JOHN PATTEN, jun., Hulne Park, Alnwick, . . . . .	1907
CHARLES PENRHYN ACKERS, Huntly Manor, Gloucester, . . . . .	1908
ROBERT HOWIE, Beechwood, Arbroath, . . . . .	1908
JOHN TROTTER, B.Sc., 5 Argyle Park Terrace, Edinburgh, . . . . .	1908
JAMES A. S. WATSON, Downieken, Dundee, . . . . .	1908

## SYLLABUS OF EXAMINATION

### I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

I. *Principles of Scientific Forestry*.—1. Effects of heat, light, moisture, and air-currents on forest vegetation. 2. Effects of depth, porosity, moisture, and chemical composition of the soil on forest vegetation. 3. Effects of forest vegetation on the soil and air. 4. Rate and extent of development, longevity, and reproductive power of trees. 5. Pure and mixed woods. 6. Systems of silviculture.

II. *Forest Organisation*.—7. General ideas regarding a regulated system of forest management. 8. Knowledge of working plans of forests.

III. *Practical Management of Woods*.—9. Draining and irrigation. 10. Choice of species for various situations. 11. Seed and sowing, including nurseries. 12. Planting. 13. Natural regeneration by seed, shoots, and suckers. 14. Formation of mixed woods. 15. Tending of young woods. 16. Pruning. 17. Thinning. 18. Sylvicultural characteristics of the principal trees.

IV. *Injuries by Storms and Fires*.—19. Storms. 20. Fires.

V. *Timber*.—21. Its technical properties. 22. Its defects. 23. Recognition of different kinds of timber. 24. Processes for increasing its durability.

VI. *Utilisation of Produce*.—25. Uses of wood and other produce. 26. Felling. 27. Conversion. 28. Seasoning. 29. Transport. 30. Sales. 31. Harvesting of bark.

## II.—FOREST BOTANY AND FOREST ZOOLOGY.

### (a) FOREST BOTANY.

The fundamental facts of morphology, physiology, and classification of plants. The structure and function of the plant-cell and the plant-tissues. Their primary distribution. The secondary changes they exhibit in consequence of perennation.

The structure and function of the root and shoot in flowering-plants. Buds, their forms and uses. The flower. The fruit. The seed.

The structure and function of vegetative and reproductive organs of fungi.

Relationship of plants to air, soil, and water. Effect of light, heat, and mechanical agencies upon plants. Nutrition. The nature and elements of the food of plants. Sources of plant-food. The absorption, elaboration, transference, and storage of food. Respiration and transpiration. Parasites and saprophytes. Symbiosis.

Growth of plants in length and thickness. Correlation of growth, pruning. Germination of seeds. Formation of wood and bark. Healing of wounds.

Diseases of plants due to faulty nutrition and unfavourable circumstances of growth. Diseases due to attacks of fungi.

Natural reproduction and propagation by seeds and by buds. Fertilisation of flowers. Hybridisation. Artificial propagation by budding, grafting, layering, and cutting.

The characters of the large groups and classes of the vegetable kingdom. The characters of the families of plants which include the chief timber trees. The botanical characteristics of the principal British forest-trees (including the structural features of their wood). The weeds of the forest and their significance.

### (b) FOREST ZOOLOGY.

The group Insecta: its position in the animal kingdom. Structure, mode of reproduction, and metamorphosis of insects. The outlines of classification of the group. Conditions favourable to the numerical increase of insects. Natural checks to increase (*e.g.*, birds, mammals, parasitic insects). The identification and life-history of the more important insects injurious to forest-trees and fruit-trees. The damage caused by these insect pests and their mode of attack. The damage caused by animals. Preventive and remedial measures.

### III.—PHYSICS, CHEMISTRY, AND METEOROLOGY.

#### *Physics.*

Mass, weight, specific gravity, solid, liquid, and gaseous states of matter. Capillarity, osmose, vapour tension, suction pump, force pump, syphon, barometer, atmospheric pressure. Boyle's law. Levers and pulleys. Heat, measurement of heat, specific heat; transference of heat by conduction, convection, and radiation. Boiling and freezing. Latent heat. The thermometer. The conservation and transformation of energy. Light—reflection, refraction, polarisation; the spectrum. The rudiments of electricity and magnetism.

#### *Chemistry.*

Elements. Oxygen, hydrogen, nitrogen;—their preparation, properties, and chief compounds. Acids, bases, salts. Combustion, oxidation, reduction. Sulphur, carbon, phosphorus; and their compounds, with oxygen and hydrogen. Metals—potassium, sodium, calcium, magnesium, aluminium, iron, copper, lead, mercury, and their chief compounds. Carbohydrates, marsh gas, olefiant gas, alcohol, acetic acid, oxalic acid. Distillation of wood and coal.

#### *Meteorology.*

The atmosphere, its composition and physical properties. Measurement of pressure and temperature. The barometer. Rain, hail, snow, fog, cloud, dew, the dew point, hoar frost. The weathering of rocks and soils. Gases injurious to vegetation.

### IV.—FOREST ENGINEERING, INCLUDING LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, BRIDGING, ROAD-MAKING, AND SAWMILLS.

1. The use of the level and measuring-chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, fagots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances. 6. The construction and working of estate saw-mills.

### V.—ARITHMETIC—BOOK-KEEPING.

1. Arithmetic—including Practice, Proportion, and Decimal Fractions. 2. Book-keeping—including the description of books to be kept, and the solution of practical questions in Book-keeping and the preparation of Accounts.

## EXAMINATION PAPERS, 1908

### PRACTICAL FORESTRY.

1. An area of 20,000 acres is to be planted on the "Block" or Working Plan system at the rate of 200 acres yearly. The general lie of the land is south to south-east, and rises from 200 to 800 feet above sea-level.

The prevailing winds blow from south or south-south-west. How would you place your "Blocks" so as to avoid destruction by wind-storms when felling begins? Give your reasons.

2. In forming certain plantations, light-demanding and shade-bearing trees are necessary. Describe briefly what you consider light-demanding and shade-bearing varieties, giving a list of names of each with a short description, also how you would distribute the crop, and why.

3. Name and describe a few of the fungoid diseases incidental to forest trees :—

- (a) Disease of the root ;
- (b) Disease of the stem ; and
- (c) Disease of the leaf.

Describe briefly the cause and effect, and say which are Saprophytes and which Parasites.

4. Give a short description of a sawmill suitable for the manufacture of small timbers for estate purposes, such as fencing, roofing, lintels, &c. Give speed of saw, also diameter and thickness of same for (a) cutting Pine timber, and (b) cutting Hardwoods.

5. An area of 12,000 acres of moor and heath land in the western Scottish Highlands is designed for afforestation with the ordinary commercial Coniferous forest-trees. The rotation period is fixed at 80 years, and a nursery to provide the plants necessary for the annual planting is to be formed on the area. State briefly the area of land required for the purpose, the methods you would employ in preparing the soil for the reception of (1) seeds, and (2) seedlings, also the age and description of the plants you would recommend for the stocking—both elevation and exposure being moderate.

6. A mixed plantation of Oak, Larch, and Scots Pine, 50 years of age, and situated in a mining locality, has, owing to the effects of wind-storms and other causes, become too thin for profitable cultivation as it stands, but is yet in an unprofitable stage for marketing purposes. The Oaks and Larches are sound, have well-developed stems, and are fairly equally distributed ; but the former, owing to the advent of too much light, are in danger of having their growth checked by an undesirable growth of stem or epicormic shoots. The Scots Pine are broad in crown, of an inferior description generally, and give promise of yielding a poor return on a long rotation. The number of trees remaining on the ground is still in excess of that required for the formation of the final crop. State the system of management you would adopt in order to protect the Oaks from deterioration, to raise the soil and timber value of the plantation, and to enable the Pines, if left, and the Oak to be realised at the respective ages at which they mature—viz., 90 and 130 years.

*(Two and a half hours allowed.)*

## FOREST BOTANY AND FOREST ZOOLOGY.

### (A) FOREST BOTANY.

*(Four questions only to be attempted.)*

1. Describe the structure of the stem of an Oak which is fifty years old.

2. What is mycorrhiza? How is it produced? What is its significance?

3. Define a bud. What is the object of the formation of buds on a forest-tree? Mention any forest-trees which do not form buds.

4. Why does leaf-fall take place? Describe in detail the preparations in the plant for, and the method of, leaf-fall in any tree.

5. What is meant by Metoxeny (Heterocicism)? Give an account of an illustrative example of the phenomenon, and show what its importance is in connection with Forestry.

(B) FOREST ZOOLOGY.

(Two questions only to be attempted.)

1. Give a careful account of the life-history of *Chermes abietis*. How would you treat the insect?

2. Make a list of mammals of importance in Forestry, and state whether you consider each useful or harmful, and why.

3. Give the life-history, with notes on preventive and remedial measures, of *Pissodes notatus* or *Sirex gigas*.

(Two hours allowed.)

PHYSICS, CHEMISTRY, AND METEOROLOGY.

1. Give a description of the mechanism of the suction pump, and explain why it is able to raise water. To what height can such a pump raise water? Would it make any difference if the pump were situated on a mountain 5000 feet above sea-level?

2. What is the principle of the conservation of energy? If a litre of hydrogen is burnt, what energy transformation has taken place?

3. What is a hard water? To what is the hardness of water due? How can you remove it?

4. Give an account of the preparation and properties of the oxides of carbon. How much carbon dioxide could you obtain from 20 grams of carbon?

5. What is acetic acid? How can it be obtained from wood? Mention any other method of preparation.

(An hour and a half allowed.)

LAND MEASURING, &c.

1. Calculate the area in figure 1 in acres, roods, and poles.

2. Draw on the diagram angles and chain lines outside the boundary, on the assumption that you cannot do so inside, with the object of making a plan to scale.

3. Assume that you have taken the levels of the surface of the ground from A to B (Fig. 2) in the seven different sights of back and fore observations, fill in the Level Book the back sights, fore sights, and reduced levels, &c.

4. State the gradient of road from A to B (Fig. 2).

5. Calculate the cubic contents of cutting to form the new roadway, with the depths marked of 12, 11, 10, and 11 feet at the points respectively (Fig. 2), with a breadth of roadway of 18 feet, and side slopes of  $1\frac{1}{2}$  horizontal to 1 perpendicular.

6. State whether a breast wheel, overshot wheel, or turbine is the best to develop power from water for an estate mill.

(Two hours allowed.)

## ARITHMETIC AND BOOK-KEEPING.

1. Multiply 487·658934 by 3·87946893 by the shortest method you know, bringing out the answer correct to four places of decimals.

2. Find by practice the value of 643 acres, 1 rood, 27 poles, at £1, 16s. 8d. per acre.

3. A and B undertake to do a piece of work for 8 guineas. A could do it alone in 7 days, and B alone in 8 days. With the help of C they do it in 3 days. In what proportion should the sum of 8 guineas be divided?

4. A log of timber is 18 feet long, 1 foot 4 inches wide, and 15 inches thick. If a piece containing  $2\frac{1}{2}$  cubic feet be cut off from one end, what length will be left?

5. The following are the transactions of John Woodcock, head forester on the Lowburn Estate, for the month of October 1907. Prepare therefrom a branched statement of receipts and payments, showing the bank transactions and bringing out the bank and cash balances at the end of the month. There was a balance of cash on hand of £10, and a balance due to the bank of £100 at the beginning of the month.

1907.

October	2. Received and paid into bank proceeds of sale of oak timber . . . . .	£150	0	0
"	4. Paid R. Burns, stationer . . . . .	3	0	0
"	6. Drawn from bank, and paid R. Scott for young trees . . . . .	35	0	0
"	10. Received and paid into bank proceeds of sale of larch trees by public auction . . . . .	20	0	0
"	11. Paid auctioneer's fee . . . . .	1	1	0
"	12. Cash drawn from bank . . . . .	10	0	0
"	14. Paid North British Railway Co. carriage of timber . . . . .	2	10	0
"	16. Paid John Woodcock's expenses attending Forestry Exhibition in London . . . . .	5	0	0
"	24. Paid into bank cheque received from proprietor to meet current expenditure . . . . .	200	0	0
"	25. Drawn from bank, and paid Gow & Robb, sawmillers, their account . . . . .	20	14	0
"	31. Drawn from bank, and paid wages for quarter . . . . .	100	0	0
"	" Drawn from bank, and paid John Woodcock's salary for quarter . . . . .	30	0	0
"	" Overdraft interest charged by bank . . . . .	3	11	0

6. Draft forms of sales books suitable for a forester on a large estate where there are sales both by public auction and private bargain.

*(One hour and a half allowed.)*

## DAIRY DEPARTMENT

EXAMINATION IN THE SCIENCE AND  
PRACTICE OF DAIRYING

This Examination, instituted in 1897, is conducted by the National Agricultural Examination Board, appointed jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland.

## REGULATIONS.

1. The Societies may hold annually in England and in Scotland, under the management of the National Agricultural Examination Board appointed by them, one or more Examinations for the National Diploma in the Science and Practice of Dairying; the Diploma to be distinguished shortly by the letters "N.D.D."

2. The Examinations will be held on dates and at places from time to time appointed and duly announced.

3. A non-returnable fee of £1 will be required from each candidate.

4. Forms of Entry for the Examination in England may be obtained from the Secretary of the Royal Agricultural Society of England, 16 Bedford Square, London, W.C., and must be returned to him duly filled up, with the entry-fee of £1, on or before 31st August.

5. Forms of Entry for the Examination in Scotland may be obtained from the Secretary of the Highland and Agricultural Society of Scotland, 3 George IV. Bridge, Edinburgh, and must be returned to him duly filled up, with the entry-fee of £1, on or before 31st August.

6. A candidate may enter for the Examination either in England or Scotland, but not in both; and a candidate who has once taken part in an Examination in England cannot enter for an Examination in Scotland, or *vice versa*. No candidate may sit for the Examination more than twice.

7. A candidate will be required to satisfy the Examiners, by means of written papers, practical work, and *visd voce*, that he or she has—

(1) A general knowledge of the management of a Dairy Farm, including the rearing and feeding of Dairy Stock, the candidate being required to satisfy the examiners that he or she has had a thorough training and practical experience in all the details of Dairy work as pursued on a farm.

(2) A thorough acquaintance, both practical and scientific, with everything connected with the management of a Dairy, and the manufacture of Butter and Cheese.

(3) Practical skill in Dairying, to be tested by the making of Butter and Cheese.

(4) Capacity for imparting instruction to others.

8. The Board reserve the right to postpone, to abandon, or in any way, or at any time, to modify an Examination, and also to decline at any stage to admit any particular candidate to the Examination.

16 BEDFORD SQUARE, LONDON, W.C.,

January 1909.

## SYLLABUS OF SUBJECTS OF EXAMINATION

## I.—GENERAL MANAGEMENT OF A DAIRY FARM.

1. *General Management of Pastures and Crops on a Dairy Farm.*

2. *Buildings.*—Situation, Surroundings, Construction, Ventilation, and Drainage of Farm Buildings. Suitability of building materials. Water supply. Construction and arrangements of Dairies: (a) for General Purposes; (b) for Special Purposes.

3. *Foods and Feeding.*—Summer and Winter Feeding of Dairy Cattle. Root crops. Green fodder. Ensilage. Different kinds of food and their composition. Their effect upon Milk, Butter, and Cheese. Special Foods used in Dairy Feeding. Preparation of food for Dairy Stock. Rearing

and feeding of young Stock. Feeding and management of Pigs and Poultry.

4. *Dairy Cattle in Health and Disease*.—Characteristics of different Breeds, and choice of Dairy Cattle. General functions of the organs of the animal body. Breeding. Parturition. Organs which secrete milk. Process of milk secretion. Changes which food undergoes during digestion. Diseases of Dairy Cattle and their remedies.

## II.—MANAGEMENT OF A DAIRY.

1. *Milk and Cream*.—Process of Milking. Dairy Utensils and Appliances, hand and power. Cooling of Milk. Separation and ripening of Cream. Different systems of Cream-raising. Utilisation of Skim-milk. Keeping of Milk. Importance of Cleanliness. Diseases spread by Milk. Conveyance and sale of Milk. Milk records. Keeping of Dairy and Farm Accounts. Creameries. Butter and Cheese Factories. Different systems of Dairying and their comparative returns.

2. *Butter*.—Churns and other Butter-making appliances, hand and power. Souring of Cream. Churning. Washing and working of Butter. Butter-milk. Packing and transmission of Butter. Salting and keeping of Butter. Colouring. Characteristics of good Butter.

3. *Cheese*.—Principles of its manufacture. Making of different kinds of Cheese (from cream, whole-milk, and skim-milk). Acidity of Milk. Use of Rennet and its substitutes. Whey. Appliances for Cheese-making. Ripening and storage of Cheese. Packing and sale of Cheese. Making of Cream and other soft Cheeses.

## III.—CHEMISTRY AND BACTERIOLOGY.

[*N.B.*—In this Section there will be expected of the candidate a sound understanding of the scientific principles underlying the practice of Dairying, a knowledge of the composition, nature, properties, and changes undergone by the different substances met with in Dairying, and a general acquaintance with the principles of laboratory methods so far as Dairying is concerned.]

1. *General Principles of Chemistry*.—The nature of elements and compound bodies. The different forms of matter—solid, liquid, gaseous. Specific gravity, and instruments for determining it. Temperature, and methods of measuring it. Thermometric scales. The influence of temperature in Dairy operations. Physical and chemical changes involved in the following: solution, precipitation, filtration, distillation, oxidation, and reduction. Acids, Bases, Salts—their distinctive properties. Acidity and Alkalinity—their influence and quantitative estimation.

The Atmosphere—its constituents and impurities; its influence on Dairy operations. Atmospheric pressure.

Water—constituents of pure and natural waters. The impurities of water and whence derived. The importance of a pure water-supply in Dairying.

General knowledge of the elementary chemistry of the following substances and their compounds so far as met with in Dairying: Potash, Soda, Ammonia, Lime, Phosphoric Acid, Alcohol, Acetic Acid, Carbonic Acid, Butyric Acid, Lactic Acid, Albumen, Casein, Fats, Milk-sugar, Glycerine, Pepsin.

Saponification of Fats.

2. *Milk and its Products*.—The nature, composition, properties, and chemical constituents of milk. Microscopical appearances presented by

milk. The circumstances that affect the quality and quantity of milk produced by the cow. The influence of feeding. The changes which occur in the keeping of milk, and how produced. The natural and artificial souring of milk. Rennet, its nature and use. Physical and chemical changes involved in the making and keeping of Butter, and in the manufacture and ripening of Cheese. Separated Milk, Condensed Milk, Fermented Milk. The use of Preservatives. Methods of Milk-testing—Mechanical methods, their theory and practice. A general knowledge of the methods employed in the chemical analysis of Milk and Butter. Adulteration of Milk, Cream, Butter, and Cheese—the ways in which adulteration is practised, the changes in composition thereby produced, and a general knowledge of the methods employed in detecting the same.

3. *The Chemistry of Feeding.*—The principal constituents of Food materials, and the functions they severally fulfil. The influence of Food constituents on milk production. Assimilation and Digestion. Animal Heat and Respiration. Milk as a Food. The relation of Food to Manure.

4. *Bacteriology.*—Moulds. Yeasts. Bacteria. The principal kinds of Bacteria met with in Dairying—their forms, methods of reproduction, and conditions of life. The influence of physical agencies upon Bacterial life. Air and Water as carriers of Bacteria. The changes produced by Bacteria in milk and its products. Useful forms and their functions. Harmful forms and their effects—Coagulation, Discoloration, Taints, &c. Pathogenic organisms. The classification of organisms—organised ferments and enzymes. Methods of preparation of pure cultures and their practical use. Nutritive media. Pasteurisation and Sterilisation—the practical application of these to Dairy matters. Fermentation and Putrefaction. Disinfectants and Preservatives.

#### IV.—PRACTICAL SKILL IN DAIRY WORK.

Candidates must be prepared—(1) to produce at or before the Examination a satisfactory certificate of proficiency in the Milking of Cows, signed by a practical Dairy Farmer, and to satisfy the Examiners by a practical test, if so required; (2) to churn and make into Butter a measured quantity of Cream; and (3) to make one Cheese of each of the following varieties: (i) Hard-pressed, of not less than 30 lb.; (ii) Veined or blue-moulded, of not less than 10 lb.; and (iii) also to make one or other of the following Soft Cheeses: Camembert, Coulommier, or Pont l'Évêque.

#### V.—CAPACITY FOR IMPARTING INSTRUCTION TO OTHERS.

*Candidates must also show practically that they are familiar with the management of a Dairy, and are capable of imparting instruction to others.*

#### EXAMINATIONS IN 1909.

**ENGLAND**—SATURDAY, September 18, and following days, at a centre to be announced; last date for receiving applications, TUESDAY, August 31.

**SCOTLAND**—SATURDAY, September 25, and following days, at the Dairy School for Scotland, Kilmarnock; last date for receiving applications, TUESDAY, August 31.

The following obtained the Diploma in Scotland in 1908 :—

JOHN ABERNETHY, Mains, Corsindae, Sauchen, Aberdeenshire.  
 Miss JANET HELEN DAVIDSON, Daljedburgh, Barr, Ayrshire.  
 Miss NELLY DAVIS, Preston Court, Preston-on-Wye, Hereford.  
 ALEXANDER JOHN FINDLAY, M.A., 85 Gray Street, Aberdeen.  
 LAURENCE BARNARD FOORD, The Vicarage, Kirk Ella, Hull.  
 PERCY ALEXANDER FRANCIS, Gracehill, Ballymena, Antrim.  
 ALFRED LEONARD GIBSON, Grisdale Farm, Leighton, Carnforth, Lancs.  
 Miss HARRIETT GORDON GIBSON, Cattofield House, Aberdeen.  
 JOHN HARVEY-LOUTIT, Manse of Foveran, Aberdeenshire.  
 WILLIAM MITCHELL LENNOX, Altizourie Farm, Straiton, Maybole.  
 ALLAN STEWART M'WILLIAM, 47 Brackley Street, Farnworth, R.S.O.  
 Miss ISABELLA MARSHALL, Laverockhill, Baldernock, Torrance.  
 JOSEPH MORRIS, Reiss Lodge, Wick.  
 Miss MARGARET T. SHIELL, Whitriggs, Hawick.  
 Miss MARION THOMSON SMITH SIMSON, Ruglen, Kilkerran, nr. Maybole.

The following obtained the Diploma in England in 1908 :—

Miss ELSIE MAY BEVIS, Midland Agricultural and Dairy College, Kingston, Derby.  
 OFFORD DENNIS CARTER, Essex County Council Dairy School, Chelmsford.  
 JOHN CHARLES JESSER COOPE, British Dairy Institute, Reading.  
 PHILIP CROWLEY, British Dairy Institute, Reading.  
 Miss ELLA EDWARDS, University College, Aberystwyth.  
 Miss MARGARET HOWARD, Lancashire C.C. Farm, Hutton, Preston.  
 NORMAN B. HYDE, Lancashire County Council Farm, Preston, and Midland College, Kingston, Derby.  
 Miss A. WRATE LEIGHTON, British Dairy Institute, Reading.  
 Miss MARGARET LITTLE, Midland Agricultural and Dairy College, Kingston, Derby.  
 Miss MADELINE MASON, Midland Agricultural and Dairy College, Kingston, Derby.  
 GAUPATLAL DAYASHANKER MEHTA, Midland Agricultural and Dairy College, Kingston, Derby.  
 Miss DOROTHY MAY OWEN, Midland Agricultural and Dairy College, Kingston, Derby.  
 Miss DORA GLOVER SAKER, Midland Agricultural and Dairy College, Kingston, Derby.  
 DOUGLAS WILLIAM SCOTLAND, Harper-Adams Agricultural College, Newport, Salop.  
 JOHN GEORGE WILLIAM STAFFORD, Midland Agricultural College, Kingston, Derby.  
 Miss HILDA J. M. TAYLOR, British Dairy Institute, Reading.  
 Miss DOROTHY THOMPSON, Lancashire C.C. Farm, Hutton, Preston.  
 HENRY G. VAN DER VEEN, Midland Agricultural and Dairy College, Kingston, Derby.  
 FRANK WILKINSON, Midland Agricultural and Dairy College, Kingston, Derby.

#### EXAMINATION PAPERS OF PAST YEARS.

Copies of the Papers set at the Examinations in 1907 and 1908 may be had on application. Price 6d. per set.

## CHEMICAL DEPARTMENT

*Chemist to the Society*—JAMES HENDRICK, B.Sc., F.I.C., F.C.S.,  
Agricultural Department, Marischal College, Aberdeen.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding-stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

## MEMBERS' PRIVILEGES IN RESPECT OF ANALYSES.

The fees of the Chemist for analyses made for members of the Society shall, until further notice, be as follows :—

The estimation of *one* ingredient in a manure or feeding-stuff, . . . 5s.  
The estimation of *two* or *more* ingredients in . . . do. . . 10s.  
*These charges apply only to analyses made for agricultural purposes, and for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.*

Valuations of manures, according to the Society's scale of units, will be supplied if requested.

## MISCELLANEOUS.

Analysis of water <sup>1</sup> to determine purity and fitness for domestic use (not more than one analysis per year for any one member), . . . . .	£1	0	0
Analysis of agricultural products—hay, grain, ensilage, roots, &c., . . . . .	1	0	0
Milk, full analysis, . . . . .	0	10	0
Milk, solids and fat, . . . . .	0	5	0
" fat only, . . . . .	0	2	6
Butter, full analysis, . . . . .	0	10	0
" partial analysis (water and fat), . . . . .	0	5	0
Cheese, . . . . .	0	10	0
Limestone, giving the percentage of lime, . . . . .	0	5	0
Limestone, complete analysis, . . . . .	1	0	0
Lime, including ground lime, percentage of alkaline lime, . . . . .	0	5	0
" " " complete analysis, . . . . .	1	0	0
Analysis of soil, to determine fertility and recommendation of manurial treatment, . . . . .	1	10	0

<sup>1</sup> Cases containing bottles for water samples and instructions for sampling are sent from the laboratory on application.

Complete analysis of soil, . . . . .	£2 10 0
Search for poisons in food or viscera, . . . . .	2 0 0
Sulphate of copper, percentage of copper and purity, . . . . .	0 5 0
" " complete analysis, . . . . .	0 10 0
Arsenic, carbolic acid and tar acids, and other poisons used in making sheep dips, &c., . . . . .	5s. to £1

Samples should be sent (carriage paid) to James Hendrick, B.Sc.,  
Agricultural Department, Marischal College, Aberdeen.

*Note to Members sending Samples for Analysis.*

The Directors are anxious to take any steps in their power to expose the vendors of inferior fertilisers and feeding-stuffs, and the members can give them assistance in this by supplying to the chemist, when sending samples for analyses, information as to the guarantee, if any, on which the goods were sold, and also as to the price charged.

## INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

### MANURES.

Any method of sampling mutually agreed upon between buyer and seller may be adopted, but the following method is recommended as a very complete and satisfactory one: Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the seller or his agent or two witnesses (due notice having been given to the seller of the time and place of sampling), and these samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the chemist for analysis.

### FEEDING-STUFFS.

Samples of feeding-stuffs which are in the form of meal may be taken in a similar manner.

Samples of cake should be taken by selecting four or more cakes from the bulk. These should be natted to a size not larger than walnuts. The natted cake should then be thoroughly mixed and samples of not less than one pound each taken from it. The samples should be put into bottles or tins, sealed up, and labelled. One sample should be sent to the analyst, and one or more duplicates retained by the purchaser.

### SOILS.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench vertical scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this man-

ner two pounds of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples at least should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

## VEGETABLE PRODUCTS.

*Turnips, &c.*, at least 50 bulbs carefully selected as of fair average growth.

*Hay, straw, ensilage, &c.*, should be sampled from a thin section cut across the whole stack or silo, and carefully mixed; above 2 lb. weight is required for analysis.

*Grain* should be sampled like manures.

## DAIRY PRODUCE.

*Milk*.—Samples of milk from individual cows should be taken direct from the milk-pail after complete milking. Average samples from a number of cows should be taken immediately after milking. Specify whether the sample is morning or evening milk, or a mixture of these. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed. Samples of milk should be sent immediately to the analyst.

For most purposes a half-pint bottle of milk is a large enough sample.

*Butter and Cheese*.—About quarter-pound samples are required.

## WATERS.

When the water is from a well, it should be pumped for some minutes before taking the sample.

If the well has been standing unused for a long time, it should be pumped for some hours, so that the water may be renewed as far as possible.

If the well has been newly dug or cleaned out, it should be pumped as dry as possible, daily, for a week before taking the sample.

Water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, some inches below the surface. *Water from the surface should not be allowed to enter the bottle.*

Spring or stream water should not be sampled in very wet weather, but when the water is in ordinary condition. Such waters should be sampled by immersing the bottle, if possible; but if not deep enough for that purpose, a perfectly clean cup should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing it.

Interference with or disturbance of wells or springs, or the ground in their immediate vicinity, must be carefully avoided during sampling, and for at least twenty-four hours before it.

After a sample has been taken, it should be sent to the laboratory as speedily as possible.

A description of the source and circumstances of the water should accompany the sample, as the interpretation of the analytical results depends to some extent on a knowledge of such particulars.

*N.B.*—Stone jars and old wine bottles are unsuitable for conveying samples. Winchester quarts chemically cleaned should be obtained from the laboratory, Marischal College, Aberdeen.

### LOCAL ANALYTICAL ASSOCIATIONS.

With the view of encouraging, as well as regulating the conduct of, Local Analytical Associations, the Society, from 1881 to 1893, contributed from its funds towards their expenses a sum not exceeding £250 annually. In view of the passing of the Fertilisers and Feeding Stuffs Act, 1893, it was decided, at a meeting of the Directors on the 6th of December 1893, to discontinue that grant after the 1st of March 1894.

### COMPOSITION AND CHARACTERISTICS OF MANURES AND FEEDING-STUFFS.

(See '*Transactions*,' *Fifth Series*, vol. *xi*. 1899.)

### FORMS OF GUARANTEE

#### GUARANTEE OF MANURE.

I guarantee that the manure called.....and sold by me to  
.....contains a minimum of—

<i>Soluble phosphoric acid</i>	= Phosphate of lime dissolved.....	per cent.
<i>Insoluble phosphoric acid</i>	= Phosphate of lime undissolved.....	per cent.
<i>Potash salts</i> . . .	= Potash ( $K_2O$ ) . . .	per cent.
<i>Total nitrogen</i> . . .	= Ammonia . . .	per cent.

Signature of seller.....

Date.....19...

#### GUARANTEE OF FEEDING-STUFF.

I guarantee that the feeding-stuff called.....and sold by me to  
.....contains a minimum of—

.....	per cent albuminoids.
.....	per cent oil.
.....	per cent carbohydrates.

Signature of seller.....

Date... ..19...

# UNITS TO BE USED IN DETERMINING THE MARKET PRICE OF MANURES.<sup>1</sup>

*Terms*—CASH, including Bags gross weight—not including Carriage.

*N.B.*—These units are based on the RETAIL CASH PRICES OF MANURES at Leith and Glasgow. When these units are multiplied by the percentages in the analysis of a Manure, they will produce a value representing very nearly the *cash price* per ton at which TWO TONS may be bought in fine sowable condition at Leith or Glasgow. Larger purchases may be made on more favourable terms, but for smaller purchases an extra charge of 1s. 6d. per ton is made.

FOR SEASON 1909.

CASH PRICES AS FIXED ON 3RD FEBRUARY.

Items to be Valued.	Peruvian (Riddled).		Fish Guano.	Bone Meal.	Steamed Bone Flour.	Dissolved or Vitriolated Bones.	Super- phosphates.	
	Nitrogenous.	Phosphatic.					Under 30% Sol.	30% Sol. or over.
	P. unit.	P. unit.	P. unit	P. unit	P. unit	P. unit.	P. unit.	P. unit.
Phosphates dissolved . . . . .	1/4	1/4	1/4	1/3	1/2	1/8	1/11	1/11
"    undissolved . . . . .		3/6	3/6	..	..	..	..	..
Potash . . . . .	3/6	3/6	..	..	..	..	..	..
Nitrogen . . . . .	16/	16/	14/	12/1	12/1	15/6	..	..
Prices per ton—								
From . . . . .	120/ up- wards	95/ up- wards	95/ up- wards	105/-	85/-	105/-	50/-	
To . . . . .		..	..	..	115/-	95/-	110/-	73/-

MANURES			
At LEITH and GLASGOW, except in case of Thomas-slag phosphate.	Guarantee.	Price per Ton.	Unit.
Sulphate of ammonia . . . . .	20 Nitrogen	£ s. d. 11 15 0	Nit. = 11/9
Nitrate of soda, 96 per cent. <sup>2</sup> . . . . .	15-5 "	9 10 0	" = 12/3
Muriate of potash, 80 per cent . . . . .	50 Potash	8 15 0	Pot. = 8/6
Sulphate of potash . . . . .	52 "	9 15 0	" = 3/9
Kainit (unpulverised) . . . . .	12-4 "	2 5 0	" = 3/7½
Potash salts . . . . .	50 "	4 15 0	" = 3/2
Basic slag (Thomas-phosphate pow- der), at place of production . . . . .	22 Phosphate	1 7 6	Phos. = 1/3
	30 "	1 15 0	" = 1/2
	38 "	2 5 0	" = 1/2
Ground mineral phosphate . . . . .	60 "	2 10 0	" = 1/0

*NOTE.*—This Schedule of Unit Prices of Manures and Feeding-Stuffs is revised each year in the first week of February. Copies of the Schedule may be had by Members any time thereafter.

<sup>1</sup> Instructions regarding units and the valuation of manures are given on p. 86.

<sup>2</sup> These are the February prices, but they are subject to variation from month to month or oftener.

FEEDING-STUFFS.				Price per ton at Leith and Glasgow.
	Average Analyses.			
	Album.	Oil.	Carbo- hydrates.	
Linseed-cake . . . . .	28	10	85	£ s. d. 8 12 6
" Canadian or American . . . . .	30	8	35	8 2 6
Decorticated cotton-cake . . . . .	40	9	25	7 10 0
" " Seed-meal . . . . .	40	9	25	7 10 0
Uncorticated " (Egyptian) . . . . .	22	5	53	5 12 6
" " (Bombay). . . . .	19	4.5	35	4 15 0
Bean-meal, English * . . . . .	25	1.5	50	8 5 0
Rice-bran, Rangoon . . . . .	12	18	50	5 10 0
Locust-bean meal . . . . .	6	1	70	5 10 0
Dried Distillery grains † . . . . .	20	8	45	5 10 0
" Brewery or malt distillery grains † . . . . .	20	6	45	5 5 0
Barley-bran . . . . .	15	5	50	†
Indian corn (American) * . . . . .	10	5	70	6 10 0
Paisley meal (at Paisley) . . . . .	15	9	60	6 5 0
Linseed (whole) . . . . .	22	35	22	13 10 0
Linseed-oil . . . . .	..	..	..	24 0 0
Treacle . . . . .	..	..	..	5 5 0

\* These are the February prices, but they are subject to variation from month to month or oftener.  
† Bags included. ‡ From £8, 10s. to £8, 10s.

### CLASSIFICATION OF MANURES.

Peruvian guano . . . . .	{	Guanos with over 4 per cent of nitrogen are to be considered as nitrogenous. Those with less than this percentage are to be classed as phosphatic guano.
Bone-meal . . . . .	{	Genuine bone-meal contains from 48 per cent to 55 per cent phosphates, and from 3½ per cent to 4½ per cent nitrogen. If phosphates are low, nitrogen will be high, and conversely. If bone-meal is so finely ground that 90 per cent or over passes a sieve of ½-inch mesh, an addition of 2s. 6d. per ton should be made to the valuation.
Steamed bone-flour . . . . .	{	Ground to flour, and containing about 60 to 65 per cent phosphates and about 1 to 1½ per cent nitrogen.
Dissolved bones . . . . .	{	Must be pure—i.e., containing nothing but bones and sulphuric acid.
Mixtures and compound manures . . . . .	{	To be valued according to the following unit prices: nitrogen, 12s.; soluble phosphate, 1s. 11d.; insoluble phosphate, 1s. 3d.; potash, 8s. 3d.; with an addition of 4s. per ton for bags and 7s. 6d. per ton for mixing. These units give the cash price at Leith and Glasgow. They apply only to mixtures made from high-class materials. For instance, the nitrogen of mixtures valued by these units should not be from shoddy, hair, or leather, or the insoluble phosphates from ground mineral phosphates.
Basic slag (Thomas-phosphate powder) . . . . .	{	About 90 per cent of the phosphate should be citric soluble (official method of Board of Agriculture). Fineness of grinding is of importance. The coarsest kind used should be so finely ground that at least 80 per cent passes through a wire sieve of about 9600 holes per sq. inch.

### INSTRUCTIONS FOR VALUING MANURES.

The unit used for the valuation of manures is the hundredth part of a ton, and as the analyses of manures are expressed in parts per hundred, the percentage of any ingredient of a manure when multiplied by the price

of the unit of that ingredient represents the value of the quantity of it contained in a ton.

As an example take muriate of potash—a good sample (see p. 35) will be guaranteed to contain 80 per cent *pure* muriate of potash; the other 20 per cent consisting of unimportant impurities, such as common salt. But all potash manures are valued according to the amount of POTASH they yield, and 80 per cent of pure muriate of potash yields 50 per cent potash ( $K_2O$ )—i.e., 50 units per ton; and as a ton of muriate of potash costs £8, 15s., the price of the unit is the fiftieth part of that—viz., 3s. 6d. If on analysis a sample of muriate of potash guaranteed to contain 50 per cent of potash is found to contain only 49 per cent, the price per ton will be 3s. 6d. less—viz., £8, 11s. 6d.

Similarly with all other manures, the price per unit is derived from the price per ton of a sample of good material up to its guarantee, and therefore the proper price per ton of a manure is found by multiplying the price of the unit of the valuable ingredient by the percentage as found by analysis. If a manure contains more than one valuable ingredient, the unit value of each ingredient is multiplied by its percentage, and the values so found when added together give approximately the price per ton of the manure.

Nitrate of soda contains no ammonia, but it contains nitrogen, and 14 units of nitrogen are equivalent to 17 units of ammonia.

The commercial values of manures are determined by means of the UNITS in the following manner:—

Take the analysis of the manure, and look for the following substances:—

Phosphates dissolved (or soluble phosphate)	} No other items but these are to be valued.
"    undissolved (or insoluble    "	
Nitrogen . . . . .	
Potash . . . . .	

*Should the analysis or the guarantee not be expressed in that way, the chemist or the seller should be asked to state the quantities in these terms.*

Suppose the manure is bone-meal:—

An ordinary bone-meal will contain about 50 per cent phosphate and about  $3\frac{1}{2}$  per cent nitrogen. The units for bone-meal are 1s. 3d. for phosphate and 12s. 1d. for nitrogen. Therefore the value is—

Insol. phosphate, 50 times 1s. 3d., equal to	£3 2 6
Nitrogen, $3\frac{1}{2}$ times 12s. 1d., equal to	2 5 4

Say £5 7 10 per ton.

Suppose the manure is dissolved or vitriolated bones:—

It must be guaranteed "pure."

The units in the Schedule are 2s. 3d. for soluble phosphate, 1s. 8d. for insoluble phosphate, and 15s. 6d. for nitrogen.

The analysis will be about 16 per cent soluble phosphate, 18 per cent insoluble phosphate, and  $2\frac{1}{2}$  per cent nitrogen. In that case the value would be—

Sol. phosphate,	16 times 2s. 3d., equal to	£1 16 0
Insol.    "	18    "    1s. 8d.,    "	1 10 0
Nitrogen,	$2\frac{1}{2}$ "    15s. 6d.,    "	2 2 8

Say £5 8 8 per ton.

Suppose the manure is a superphosphate,—say an ordinary superphosphate, with 38 per cent soluble phosphate and 2 per cent insoluble phosphate. It is valued thus:—

Sol. phosphate, 38 times 1s. 11d., equal to, say, £3, 12s. 10d. per ton.  
*Insoluble phosphate is not valued in a superphosphate.*

*Nota.*—The units have reference solely to the MARKET PRICE of Manures, and not to their AGRICULTURAL VALUES.

*Thus, in stating soluble phosphate in dissolved bones at 2s. 3d. per unit, and that in superphosphate at 1s. 11d., it is meant that these are the prices per unit at which soluble phosphate can be bought in these two manures; but it does not mean that the soluble phosphate in the one is 4d. per unit better as a manure than that in the other. It is probably no better.*

## BOTANICAL DEPARTMENT

*Consulting Botanist to the Society—A. N. M'ALPINE,*  
6 Blythswood Square, Glasgow.

The Society have fixed the following rates of charge for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

### *Scale of Charges.*

1. A report on the purity, amount, and nature of foreign materials, and the germinating power of a sample of seed, 1s.
2. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention, 1s.
3. Report on any disease affecting farm crops, 1s.
4. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value, 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural or horticultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

### *Purchase of Seeds.*

The purchaser should obtain from the vendor, by invoice or other writing, the proper designation of the seed he buys, with a guarantee of the percentage of purity and germination, and of its freedom from ergot, and in the case of clover, from the seeds of dodder or broom-rape.

It is strongly recommended that the purchase of *prepared mixtures* of seeds should be avoided. The different seeds should be purchased separately and mixed by the farmer: mixtures cannot be tested for germination.

### *The Sampling of Seeds.*

The utmost care should be taken to secure a fair and honest sample. This should be drawn from the bulk delivered to the purchaser, and not from the sample sent by the vendor.

When legal evidence is required, the sample should be taken from the bulk, and placed in a sealed bag in the presence of a witness. Care should be taken that the sample and bulk be not tampered with after delivery, or mixed or brought in contact with any other sample or bulk.

At least one ounce of grass and other small seeds should be sent, and two ounces of cereals and the larger seeds. When the bulk is obviously impure the sample should be at least double the amount specified. Grass seeds should be sent at least four weeks, and seeds of clover and cereals two weeks, before they are to be used.

The exact name under which the sample has been sold and purchased should accompany it.

*Reporting the Results.*

The Report will be made on a schedule in which the nature and amount of impurities will be stated, and the number of days each sample has been under test, with the percentage of the seeds which have germinated.

"Hard" clover seeds, though not germinating within the time stated, will be considered good seeds, and their percentage separately stated.

The impurities in the sample, including the chaff of the species tested, will be specified in the schedule, and only the percentage of the pure seed of that species will be reported upon; but the REAL VALUE of the sample will be stated. The Real Value is the combined percentages of purity and germination, and is obtained by multiplying these percentages and dividing by 100: thus in a sample of Meadow Fescue having 88 per cent purity and 95 per cent germination, 88 multiplied by 95 gives 8360, and this divided by 100 gives 83·6, the Real Value.

*Selecting Specimens of Plants.*

The whole plant should be taken up and the earth shaken from the roots. If possible the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. They should be placed in a bottle, or packed in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

Parcels or letters containing seeds or plants for examination (carriage or postage paid) must be addressed to Professor M'Alpine, Botanical Laboratory, 6 Blythswood Square, Glasgow.

## ENTOMOLOGICAL DEPARTMENT

*Consulting Entomologist to the Society*—Dr R. STEWART MACDOUGALL,  
13 Archibald Place, Edinburgh.

Arrangements have been made with Mr R. Stewart MacDougall, M.A., D.Sc., Edinburgh, to advise members of the Society regarding insects or allied animals which, in any stage of their development, infest—

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| (a) Farm crops.                   | (d) Fruit and fruit trees.          |
| (b) Stored grain.                 | (e) Forest trees and stored timber. |
| (c) Garden and greenhouse plants. | (f) Live stock (including poultry). |

Members consulting Dr MacDougall will please forward with their queries examples of the injured plants, or the injured parts of plants, &c., as well as specimens of the insects or other animals believed to be the cause of the injury.

Specimens should be sent in tin or wooden boxes, or in quills, to prevent injury in transmission.

Address letters and parcels (carriage or postage paid) to Dr R. Stewart MacDougall, 13 Archibald Place, Edinburgh.

The Directors have fixed the fee payable by members to Dr MacDougall at 1s. for each case upon which he is consulted: this fee must be sent to him along with the application for information.

## PREMIUMS

### GENERAL REGULATIONS FOR COMPETITORS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'

2. All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter, similarly marked, containing the name and address of the reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to the Premium offered, or a portion of it, will be opened without the author's consent.

4. Reports for which a Premium, or a portion of a Premium, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. The Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded or accepted. Weights and measurements must be indicated by the imperial standards.

7. The Directors, before or after awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all matters relating to Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject, whether included in the Premium List or not; and if the topic and the treatment of it are both approved, the writer may be remunerated and his paper published.

## CLASS I.

## REPORTS.

## SECTION 1.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

## FOR APPROVED REPORTS.

1. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purpose chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

2. Approved Reports on other suitable subjects. To be lodged by 1st November in any year.

## SECTION 2.—ESTATE IMPROVEMENTS.

## FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

3. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold

**Medal, or Five Sovereigns.** To be lodged by 1st November in any year.

The Reports in competition for Nos. 2, 3, and 4 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return and a certified measurement of the ground are requisite.*

5. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

6. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 5 and 6 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

### SECTION 3.—HIGHLAND INDUSTRIES AND FISHERIES.

#### FOR APPROVED REPORTS.

1. The best mode of treating native Wool; cleaning, carding, dyeing, spinning, knitting, and weaving by hand in the Highlands and Islands of Scotland—Five Sovereigns. To be lodged by 1st November in any year.

### SECTION 4.—MACHINERY.

#### FOR APPROVED REPORTS.

To be lodged by 1st November in any year.

### SECTION 5.—FORESTRY DEPARTMENT.

#### FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat-bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

## CLASS II.

### DISTRICT COMPETITIONS.

#### REGULATIONS 1909.

*Grants in aid of DISTRICT COMPETITIONS for 1910 must be applied for before 1st November 1909, on Forms to be obtained from the Secretary.*

*When a Money Grant has expired, the District cannot apply again for another Money Grant for four years.*

### SECTION I.—GRANTS TO DISTRICT SOCIETIES FOR HORSES, CATTLE, SHEEP, AND PIGS.

1. CLASS OF STOCK—LIMIT OF GRANTS, £340.—The Highland and Agricultural Society will make Grants to District Societies for prizes for *Breeding Animals* of any of the following Classes of Stock, viz. :—

#### *Cattle.*

Shorthorn.  
Aberdeen-Angus.  
Galloway.  
Highland.  
Ayrshire.  
Jersey.

#### *Horses.*

Draught Horses.  
Hunters.  
Hackneys.  
Ponies.  
Shetland Ponies.

#### *Sheep.*

Blackface.  
Cheviot.  
Border Leicester.  
Half-Bred.  
Shropshire.  
Oxford Down.  
Suffolk.  
Wensleydale.

#### *Swine.*

Any Pure Breed.

Cross-bred animals are not eligible. The Prizes must be confined to *Breeding Animals*; “bullocks,” “geldings,” “wethers,” and “hog pigs” are excluded.

2. All Competitions must be at the instance of a local Society. A Committee of Management shall be appointed, and the Convener of the Committee must be a Member of the Highland and Agricultural Society.

3. GRANT TO DISTRICT, £12.—The portion of the Grant to any one District Society shall not exceed the sum of £12 in any one year.

4. ALLOCATION OF GRANT.—The Grant from the Highland and Agricultural Society is not to be applied as a Grant in aid of the Premiums offered by the Local Society, but must be offered in the form of separate Prizes for the Animals chosen; and the Prizes must be announced in the *Premium List and Catalogue of the Show* as “given by the Highland and Agricultural Society.”

5. CONTINUANCE OF GRANT THREE YEARS.—The Money Grant shall continue for three alternate years, provided always that the District Society

shall, in the two intermediate years, continue the competition by offering Premiums for the same class of Stock as that selected in each previous year to compete for the Highland and Agricultural Society's Prizes. If no competition takes place for two years the Grant expires.

6. When it is agreed to hold the General Show of the Society in any district, no provincial show shall be held in that district in the months of June, July, or August.

7. MEDALS IN INTERMEDIATE YEARS.—In the two alternate years the Highland and Agricultural Society will place three Silver Medals at the disposal of the District Societies, for the same classes of Stock as those for which the Money Premiums are offered, provided that not less than three lots are exhibited in the same class.

8. RULES OF COMPETITION.—The Rules of Competition for the Premiums, the Funds for which are derived from Grants of the Highland and Agricultural Society, shall be such as are generally enforced by the Society receiving the Grant for Premiums offered by itself.

9. AREA AND PARISHES.—FIVE PARISHES.—When making application for Grants from the Highland and Agricultural Society, the District Society must delineate the area and the number of parishes comprised in the district, and, *except in special cases*, no District Society shall be entitled to a Grant whose show is not open to at least *five* Parishes.

10. REPORTS.—Blank Forms for Reports will be furnished to the Secretaries of the different District Societies. Both in the years when the Grant is offered and in the two intermediate years, detailed reports of the competition must be given on these Forms and lodged with the Secretary of the Highland and Agricultural Society as soon as possible after the Show, and in no case later than 1st November. These reports are subject to the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All Reports must be signed and certified as marked in the Form.

11. GRANTS—WHEN PAID.—The Grants made to District Societies will be paid in December after the Reports of the awards of the prizes have been received and found to be in order and passed by the Board of Directors, the Money Grants being paid to the Secretaries of the Local Societies and the Medals sent direct to the winners. *The Secretary of the District Society must not on any condition whatever pay any premium offered by the Highland and Agricultural Society until he has been informed that the awards are in order and has received the Grant from the Highland and Agricultural Society.*

12. RENEWAL OF APPLICATION.—No application for renewal of a Money Grant to a District Society will be entertained until the expiration of *four* years from the termination of the last Grant.

13. DISPOSAL OF APPLICATIONS.—In disposing of applications for District Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those District Societies which have been longest off the list.

## DISTRICTS.

1. CAITHNESS.—*Convener*, E. W. Horne, Stirkoke, Wick; *Secretary*, George Harrold, Accountant, Wick. Granted 1905. (Medals not awarded in 1908.) (Grant of £12 for 1909 and 3 Medals for 1910.)
2. ANNANDALE UNION.—*Convener*, D. J. Bell Irving, Bankside, Lockerbie; *Secretary*, J. R. Byers, Royal Bank Buildings, Lockerbie. Granted 1905.

3. MORAYSHIRE.—*Convener*, George A. M'Lean of Westfield, Elgin; *Secretary*, W. Rose Black, Town and County Bank, Elgin. Granted 1905.
4. SPEY, AVEN, AND FIDDICHSIDE.—*Convener*, John Sims, Mains, Aberlour; *Secretary*, Robert Dick Stuart, Seafeld Square, Rothes. Granted 1905.
5. WESTERN DISTRICT OF FIFE.—*Convener*, Robt. Jeffrey, Drumfin, Torryburn; *Secretary*, Robert Husband, 1 Douglas Street, Dunfermline. Granted 1905.
6. DALBEATTIE.—*Convener*, Wellwood Maxwell of Kirkennan, Dalbeattie; *Secretary*, J. E. Milligan, Solicitor, Dalbeattie. Granted 1905.
7. FORTH.—*Convener*, David M'Culloch, The Inn, Forth; *Secretary*, James Wilson, jun., Mosshat, Cobbinshaw. Granted 1904. (In abeyance in 1905 on account of the Glasgow Show.)
8. KINCARDINESHIRE.—*Convener*, James Alexander, Bent, Laurecekirk; *Secretary*, A. B. Annandale, Stonehaven. Granted 1904. (In abeyance in 1908 on account of the Aberdeen Show.)
9. KINGLASSIE.—*Convener*, William Meiklem, Begg, Kirkcaldy; *Secretary*, Alexander Wallace, Solicitor, Kirkcaldy. Granted 1907.
10. WEST LINTON.—*Convener*, John H. Forbes of Medwyn, West Linton; *Secretary*, F. W. Dyson, Chapelhill, Peebles. Granted 1907.
11. ABERDOUR.—*Convener*, W. J. Keith, Aberdour House, Fraserburgh; *Secretary*, William Chapman, Woodhead, New Aberdour. Granted 1906. (In abeyance in 1908 on account of the Aberdeen Show.)
12. ROYAL NORTHERN.—*Convener*, George J. Walker, Hillside House, Portlethen; *Secretary*, Robert R. Ross, Balmoral Buildings, 67 Green, Aberdeen. Granted 1906. (In abeyance in 1908 on account of the Aberdeen Show.)
13. NITHSDALE.—*Convener*, William Barber of Terreran, Moniaive; *Secretary*, David Paterson, Solicitor, Thornhill. Granted 1909.
14. STRATHSPEY.—*Convener*, John Smith, Seafeld Estates Office, Grantown-on-Spey; *Secretary*, John Mackintosh, Solicitor, Grantown-on-Spey. Granted 1909.
15. ST MARY'S ISLE ESTATES AND DISTRICT.—*Convener*, John Wilkinson, The Grange, Kirkcudbright; *Secretary*, John Gibson, Solicitor, Kirkcudbright. Granted 1909.
16. EAST KILBRIDE.—*Convener*, Peter Craig, Letterick, Cambuslang; *Secretary*, William Strang, 141 West George Street, Glasgow. Granted 1909.
17. LOWER WARD OF RENFREWSHIRE.—*Convener*, Sir Hugh Shaw Stewart, Bart., Ardgowan, Greenock; *Secretary*, R. Stewart Walker, 11 William Street, Greenock. Granted 1909.
18. WESTER ROSS.—*Convener*, Duncan Davidson of Tulloch, Dingwall; *Secretary*, James Cumming, County Buildings, Dingwall. Granted 1909.
19. WIGTOWN.—*Convener and Secretary*, William Murray, Borrowmoss, Wigtown. Granted 1909.
20. BUTE.—*Convener*, Hugh M'Lean, Ascog Farm, Bute; *Secretary*, James Fisher, 5 King Street, Rothesay. Granted 1909.
21. BLACK ISLE.—*Convener*, T. Middleton, Davidston, Cromarty; *Secretary*, John Mann, Burnfarm, Avoch. Granted 1904. (In abeyance in 1905 and 1907 on account of the Joint Show.)
22. INVERNESS-SHIRE.—*Convener*, James Gossip, Provost of Inverness; *Secretary*, D. Gray, 30 Union Street, Inverness. Granted 1903. (In abeyance in 1903 and 1907. Grant given to the Joint Show.) (In abeyance in 1906. Overlooked to award Grant.)

23. NETHER LORN.—*Convener*, John Gillies, Bamacary, Kilninver ; *Secretary*, Donald M'Innes, Estate Office, Kilbrandon, Oban. Granted 1906.
24. DALKEITH.—*Convener*, James Snodgrass, Bryans, Dalkeith ; *Secretary*, John S. Warden, 7 South Street, Dalkeith. Granted 1905. (In abeyance in 1907 on account of the Edinburgh Show.)
25. WEST LOTHIAN.—*Convener*, David Allison, Duddingston, South Queensferry ; *Secretary*, Archibald Cochrane, Trinlaymire, Linlithgowshire. Granted 1905. (In abeyance in 1907 on account of the Edinburgh Show.)
26. MONKTON, NEWTON, PRESTWICK, AND ST QUIVOX.—*Convener*, James Andrew, Muirhouse, Monkton ; *Secretary*, Hugh Boyd, jun., 57 Main Street, Prestwick. Granted 1908.
27. NEW CUMNOCK.—*Convener*, Archibald Brown of Westland, New Cumnock ; *Secretary*, Robert Mitchell, Aftonwai, Mauchline. Granted 1908.
28. ESKDALE AND LIDDESDALE.—*Convener*, Thomas Gaskell, Murtholm, Langholm ; *Secretary*, Alexander Thomson, British Linen Bank, Langholm. Granted 1908.
29. EDINBURGH AGRICULTURAL ASSOCIATION.—*Convener*, Colonel R. Gordon Gilmour of Craigmillar, The Inch, Liberton ; *Secretary*, James Wylie, Royal Bank, Leith. Granted 1908.
30. BATHGATE.—*Convener*, William C. Ferrier, Birkenshaw, Bathgate ; *Secretary*, Hugh A. Heggie, Solicitor, Bathgate. Granted 1908.
31. SUTHERLAND.—*Convener*, Archibald Argo, Solicitor, Golspie ; *Secretary*, Peter Stuart, Clynelish, Brora. Granted 1908.
32. STRANRAER AND RHINS OF GALLOWAY.—*Convener*, James M'Clean, Auchneel, Stranraer ; *Secretary*, Percy John Adair, Solicitor, Stranraer. Granted 1908.
33. UNITED BANFFSHIRE.—*Convener*, William MacIntosh, Factor, Banff ; *Secretary*, John A. Badenoch, Accountant, Banff. Granted 1906. (In abeyance in 1908 on account of the Aberdeen Show.)
34. ANGUS.—*Convener*, Arch. Whyte, Inverquharity, Kirriemuir ; *Secretary*, James Kydd, 86 High Street, Arbroath. Granted 1905. (In abeyance in 1908 on account of the Aberdeen Show.)
35. MAR.—*Convener*, Charles Rennie, West Fintray, Kintore ; *Secretary*, Neil Smith, Blackburn, Kinellar. Granted 1907. (In abeyance in 1908 on account of the Aberdeen Show.)
36. DUNBLANE.—*Convener*, A. H. Anderson, Kippendavie Estate Office, Dunblane ; *Secretary*, James Barty, Solicitor, Dunblane. Granted 1906.
37. CAMPSIE, STRATHBLANE, AND BALDERNOCK.—*Convener*, Robert Watson, North Baldowie ; *Secretary*, Donald Ferguson, Quarry Lane, Lennoxtown. Granted 1908.

#### In 1909.

No. 1 is in competition for the Money Grant for the last year, will receive Medals in 1910.

Nos. 2, 3, 4, 5, 6, 7, and 8 are in competition for the last year.

Nos. 9, 10, 11, and 12 are in competition for the second year.

Nos. 13, 14, 15, 16, 17, 18, 19, and 20 are in competition for the first year.

Nos. 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, and 35 compete for local Premiums.

Nos. 36 and 37 are in abeyance on account of the Stirling Show.

## SECTION 2.—GRANTS TO HORSE ASSOCIATIONS, &c., FOR STALLIONS FOR AGRICULTURAL PURPOSES.

1. **HORSES—LIMIT OF GRANT, £210.**—The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging Stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £210 in any one year.

2. **GRANT TO EACH, £15.**—The portion of the Grant to any one Horse Association, &c., shall not exceed the sum of £15 in any one year.

3. **CONTINUANCE OF GRANT THREE YEARS—INTERMEDIATE YEAR.**—The Grant shall continue for three alternate years, provided always that the Horse Association or Society shall, in the two intermediate years, offer at least a sum equal in amount to that granted by the Highland and Agricultural Society for the hire of a Horse in connection with the Association or Society to whom the Grant is made.

4. **PENALTY FOR NOT ENGAGING HORSE.**—In the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

5. **RULES 2 (Committee and Convener), 9 (Reports), 10 (Time of Payment), 11 (Renewal of Grant), and 12 (Disposal of Applications)** applicable to Section 1, shall be applicable to Section 2.

## DISTRICTS.

1. **CAITHNESS HORSE-BREEDING ASSOCIATION.**—*Convener*, Robert Morris, Reiss Lodge, Wick; *Secretary*, A. G. Doull, Berriedale, R.S.O., Caithness. Granted 1905.
2. **MORAY HORSE-BREEDING ASSOCIATION.**—*Convener*, Andrew B. Leitch, Inchstelly, Forres; *Secretary*, H. M. S. Mackay, Bank Agent, Elgin. Granted 1905.
3. **CARSE AND DUNDEE DISTRICT STALLION SOCIETY.**—*Convener*, Captain Clayhills Henderson of Invergowrie, R.N., Dundee; *Secretary*, Thomas S. Thoma, Benzie, Dundee. Granted 1905.
4. **SELKIRK AND GALASHIELS.**—*Convener*, Thos. D. Connochie, M.R.C.V.S., Galashiels; *Secretary*, D. C. Finlay, National Bank House, Galashiels. Granted 1905.
5. **BUCHLYVIE AND VALE OF MENTEITH HORSE-BREEDING SOCIETY.**—*Convener*, Stephen Mitchell of Boquhan, Kippen Station; *Secretary*, John Drysdale, Arngibbon, Port of Menteith Station. Granted 1905.
6. **COWAL.**—*Convener*, John M'Alister, Ardyne, Toward; *Secretary*, . Granted 1907.
7. **KINTYRE.**—*Convener*, John Gemmell, Dalrioch, Campbeltown; *Secretary*, G. Erskine Inglis, Estates Office, Campbeltown. Granted 1907.
8. **GLENESK AND LETHNOT.**—*Convener and Secretary*, J. Crowe, Tarfside, Lochlee, Edzell. Granted 1907.
9. **WESTERN DISTRICT OF MID-LOTHIAN.**—*Convener*, J. E. Stoddart of Howden, Mid-Calder; *Secretary*, J. T. Mungle, Bank House, West Calder. Granted 1907.
10. **ROSS-SHIRE.**—*Convener*, Andrew Mackenzie of Dalmore, Alness; *Secretary*, John Ross, Millcraig, Fearn. Granted 1907.

11. FYVIE.—*Convener*, James Durno, Rothie Brisbane, Fyvie; *Secretary*, John Hay, Mill of Crichtie, Fyvie. Granted 1909.
12. TURRIFF.—*Convener*, James Beaton, Aspen Bank, Turriff; *Secretary*, R. Cruickshank, Claymires, Turriff. Granted 1909.
13. POTALLOCH.—*Convener*, Robert Miller, Torbhlaren, Lochgilphead; *Secretary*, Archd. Taylor, Ricruin, Lochgilphead. Granted 1909.
14. NAIRNSHIRE.—*Convener*, Donald A. Stewart, Lochdhu, Nairn; *Secretary*, Archd. J. Mackintosh, St Colms, Auldearn, Nairn. Granted 1909.
15. CENTRAL BANFFSHIRE.—*Convener*, John Macpherson, Mains of Mulben, Boharm; *Secretary*, George Donald, Ladyhill, Keith. Granted 1906.
16. DUMFRIES AND DISTRICT CLYDESDALE HORSE-BREEDING SOCIETY.—*Convener*, James Brown, Burnside, Hollywood; *Secretary*, George Will, Crichton Farm, Dumfries. Granted 1906.
17. BIGGAR AND PEEBLES CLYDESDALE HORSE-BREEDING SOCIETY.—*Convener*, William Noble, Lochurd, Dolphinton; *Secretary*, R. G. Murray, Spittal, Biggar. Granted 1906.
18. STRATHEARN.—*Convener*, Sir Charles Dundas of Dunira, Bart., Comrie; *Secretary*, A. Anderson Connon, Solicitor, Crieff. Granted 1906.
19. LAUDERDALE.—*Convener*, A. R. M'Dougal, Blythe, Lauder; *Secretary*, George L. Broomfield, Lauder. Granted 1908.
20. KIRRIEMUIR.—*Convener*, John Duncan, Muirhouses, Kirriemuir; *Secretary*, Stewart Lindsay, Crawford House, Kirriemuir. Granted 1908.
21. HOWE OF THE MEARNS.—*Convener*, James Alexander, Bent, Laurencekirk; *Secretary*, G. T. Brown, Cairnbeg, Fordoun. Granted 1908.
22. GLENKENS AND DISTRICT.—*Convener*, John M'Cormick, Lochenkit, Corsock, Dalbeattie; *Secretary*, Robert T. Scott, Drumhumprey, Corsock, Dalbeattie. Granted 1908.
23. ORKNEY.—*Convener*, James Johnston, Orphir House, Orphir, Orkney; *Secretary*, Robt. Scarth, Binscarth, Finstown, Orkney. Granted 1908.

#### In 1909.

Nos. 1, 2, 3, 4, and 5 are in competition for the last year.

Nos. 6, 7, 8, 9, and 10 are in competition for the second year.

Nos. 11, 12, 13, and 14 are in competition for the first year.

Nos. 15, 16, 17, 18, 19, 20, 21, 22, and 23 compete for local premiums.

#### SPECIAL GRANTS.

- £50 to the Scottish Agricultural Organisation Society for development of the Poultry Industry in the Highlands. Granted in 1909 for 3 years. —*Secretary*, John Drysdale, 5 St Andrew Square, Edinburgh.
- £40 to the Highland Home Industries Association.—*Secretary*, Miss Jessie D. C. Ross, Riverfield, Inverness. Granted 1895. (Did not hold a competition in 1899, 1900, or 1908.)
- £20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock.—*Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary*, John Howie, 58 Alloway Street, Ayr. Granted 1872.
- £25 to the Strathearn Agricultural Society on the occasion of its Centenary Show, 1909.—*Secretary*, A. Anderson Connon, Crieff.
- £5 to Shetland Agricultural Society.—*Convener*, J. M. Goudie, Lerwick; *Secretary*, James J. Brown, Lerwick. Granted 1893. (In abeyance in 1909.)

- £3 to Orkney.—*Convener and Secretary*, James Johnston, Orphir House, Orphir, Orkney. Granted 1883.
- £3 to East Mainland, Orkney.—*Convener*, Alfred Reid, Braebuster, Kirkwall; *Secretary*, John Clouston, Graemeshall, Holm, by Kirkwall. Granted 1898.
- £3 to West Mainland, Orkney.—*Convener*, W. G. T. Watt, Skail House, Stromness; *Secretary*, John Gibson, Seatter, Stromness, Orkney. Granted 1900. (In abeyance in 1909.)
- £3 to Sanday, Orkney.—*Convener*, W. Cowper Ward, Scar House, Sanday, Orkney; *Secretary*, K. H. Sinclair, Kettletoft, Sanday, Orkney. Granted 1902.
- £3 to Rousay, Orkney.—*Convener*, H. H. Horne, Trumland Farm, Rousay, Orkney; *Secretary*, Allan Gibson, Myres, Sourin, Rousay. Granted 1903. (In abeyance in 1909.)
- £3 to Gigha Agricultural Society.—*Convener*, W. J. Yorke Scarlett, of Gigha; *Secretary*, W. W. Philip, Estate Office, Gigha. Granted 1909 for 3 alternate years.
- £3 to Walls and Hoy.—*Convener*, Anderson Sutherland, Manclet, Brims, Walls, Orkney. Granted 1909 for 3 alternate years.
- £3 to South Ronaldshay and Burray, Orkney.—*Convener*, Arch. Allan, St Margaret's Hope, Orkney; *Joint-Secretaries*, William Cromarty, Widewall House, and Robert Cromarty, Sandwich House, St Margaret's Hope, Orkney. Granted 1904. (In abeyance in 1909.)
- The British Dairymaids' Association.—*Secretary*, Miss J. Barbour, N.D.D., Levenhall, Musselburgh. 1 Minor Gold Medal and 1 Medium Silver Medal for Champion Butter-making Competitions. Granted 1908.

### MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Silver Medals annually to Societies, not on the list of Cattle, Horse, or Sheep Premiums, in addition to the Money Premiums awarded in the Districts, for—

1. Best Bull, Cow, or Heifer of any pure breed included in Section 1.
2. Best Stallion, or Mare of any pure breed included in Section 1.
3. Best Tup, or Pen of Ewes of any pure breed included in Section 1.
4. Best Boar, Sow, or Breeding-Pig of any pure breed.
5. Best Pens of Poultry.
6. Best Sample of any variety of Wool.
7. Best Sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet-Milk Cheese.
13. Best Cured Butter.
14. Best Fresh Butter.
15. Best collection of Roots.
16. Best kept Fences.
17. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.

18. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
19. Best Sheep-Shearer.
20. Most expert Hedge-Cutter.
21. Most expert Labourer at Draining.
22. Best Maker of Oat-Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are granted for two years, and lapse if not awarded in those years.

No Society shall receive more than two Medals for two years.

#### *Aberdeenshire.*

1. CLUNY, MONYMUSK, MIDMAR, AND KEMNAY.—*Convener*, Ranald R. Macdonald, 16 Union Terrace, Aberdeen; *Secretary*, John Low, Balvack, Monymusk. 2 Medals. 1909.
2. GARIOCH.—*Secretary*, George A. Bruce, Inchfield, Inch. 1 Medium Medal. 1909. (For long service of farm servant.)
3. KINGSWELLS.—*Convener*, John Third, Kingspark, Countesswells; *Secretary*, John Porter, Gillahill, Countesswells. 2 Medals. 1909.
4. MONQUHITTER.—*Convener*, George Wilson, Badentyne, Monquhitter; *Secretary*, William Smith, Thornhill, Monquhitter, Turriff. 2 Medals. 1908.
5. STRICHEN.—*Convener and Secretary*, John Sleigh, Estates Office, Strichen. 2 Medals. 1909.
6. VALE OF ALFORD—ROOT, VEGETABLE, &C.—*Convener*, James Lawson, Scotmill, Alford; *Secretary*, J. A. Johnston, Schoolhouse, Tullynessle, Alford. 2 Medals. 1909.

#### *Argyllshire.*

7. MULL AND MORVERN.—*Convener*, J. H. Munro Mackenzie of Calgary, Tobermory; *Secretary*, D. M. Mackinnon, County Buildings, Oban. 2 Medals. 1908.
8. OBAN ORNITHOLOGICAL.—*Convener*, D. M'D. Skinner, George Street, Oban; *Secretary*, D. Nimmo, 12 Alma Crescent, Oban. 2 Medals. 1908.

#### *Ayrshire.*

9. COLMONELL AND BALLANTRAE.—*Convener*, Gilbert M. Hyslop, Bal-kissock, Ballantrae; *Secretary*, Andrew M'Credie, Union Bank of Scotland, Barrhill. 2 Medals. 1909.
10. CUMNOCK HORTICULTURAL.—*Convener*, William Hill, Hartfield, Cumnock; *Secretary*, D. C. Smith, Square, Cumnock. 2 Medals. 1908.
11. GIRVAN.—*Convener*, James Bone, Robstone, Girvan; *Secretary*, And. Dunlop, Royal Bank, Girvan. 2 Medals. 1908.
12. STEWARTON AND DUNLOP.—*Convener*, John Cunningham, Brae House, Stewarton; *Secretary*, James Shedden, Albert House, Stewarton. 2 Medals. 1909.

#### *Dumbartonshire.*

13. CUMBERNAULD.—*Convener*, John Duncan, Auckenbee, Croy Station; *Secretary*, R. B. Henderson, Parkview, Cumbernauld. 2 Medals. 1909.

*Dumfriesshire.*

14. **MOFFAT AND UPPER ANNANDALE.**—*Convener*, Robt. F. Grossart, Milton, Beattock; *Joint-Secretaries*, John Young, High Street, Moffat, and James Johnstone, Solicitor, Moffat. 2 Medals. 1908.
15. **SANQUHAR.**—*Convener*, Robert Sandilands, Corsebank, Sanquhar; *Secretary*, Wm. Murray, British Linen Bank, Sanquhar. 2 Medals. 1909.

*Elginshire.*

16. **FORRES AND NORTHERN FAT CATTLE CLUB.**—*Convener*, William Fraser, Balnaferry, Forres; *Secretary*, Alex. Dunbar, Solicitor, Forres. 2 Medals. 1908.

*Haddingtonshire.*

17. **UNITED EAST LOTHIAN.**—*Convener*, Thomas Elder, Stevenson Mains, Haddington; *Secretary*, John Stirling, Solicitor, Haddington. 2 Medals. 1909.
18. **GLENKENS.**—*Convener*, J. M. Kennedy, Knocknalling, Dalry; *Secretary*, James M'Gill, High Street, New Galloway. 2 Medals. 1908.

*Perthshire.*

19. **DOUNE.**—*Convener*, James Scrimgeour, Doune Lodge, Doune; *Secretary*, William Gray, Doune. 2 Medals. 1908.
20. **MOULIN.**—*Convener and Secretary*, R. M'Gillewie, Union Bank, Dunkeld. 1 Medal. 1909.
21. **WEEM.**—*Convener*, Robert Menzies, Tirinie, Aberfeldy; *Secretary*, Thomas Yool, Camserney Cottage, Aberfeldy. 2 Medals. 1908.

*Ross-shire.*

22. **KILTEARN: ALNESS AND ROSSKEEN CROFTERS' CLUB.**—*Convener*, Thomas W. Cuthbert, Auchindunie, Alness; *Secretary*, John Fraser, 3 Mansefield, Dingwall. 2 Medals. 1909.

*Roxburghshire.*

23. **JEDFOREST.**—*Convener*, J. A. Robson Scott of Newton, Jedburgh; *Secretary*, Richard Davidson, Swinnie, Jedburgh. 2 Medals. 1908.

Applications from other Districts must be lodged with the Secretary of the Society by 1st November next.

## RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.
2. The classes for which Medals are granted must be in accordance with the list at page 49. The Committee shall select the classes, and specify them in the Report.
3. A Committee of Management shall be appointed, and the Convener of the Committee must be a Member of the Highland and Agricultural Society.
4. The Money Premiums given in the District must be not less than £2 for each Medal claimed.
5. The Medal for Sheep-Shearing shall always accompany the highest Money Premium.

6. There must not be fewer than three competitors in all the classes.
7. Regarding Reports, despatch of Medals, and application for renewal of Grant, Rules 9 and 10, Section I., will apply.
8. When a grant of Medals has expired, the District cannot apply again for Medals for two years.

### PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society. Forms of Report to be had on application :—

#### FORM OF REPORT.

I, \_\_\_\_\_ of \_\_\_\_\_, Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the \_\_\_\_\_ Association at \_\_\_\_\_ in the county of \_\_\_\_\_ on the \_\_\_\_\_ when \_\_\_\_\_ ploughs competed ; \_\_\_\_\_ of land were assigned to each, and \_\_\_\_\_ hours were allowed for the execution of the work. The sum of £ \_\_\_\_\_ was awarded in the following proportions, viz. :—

*[Here enumerate the names and designations of successful Competitors.]*

#### RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.
2. The title of such Society or Association, together with the name and address of its Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.
3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.
4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.
5. A Member can only report one Match ; and a Ploughman cannot carry more than three Medals in the same season.
6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and not less than Three Pounds awarded in Prizes by the local Society. The Medal to be given to the winner of the first prize.
7. The Local Committee or Society may, if they desire, arrange to let each ploughman have one person to guide the horses for the first two and the last two furrows, but in no case shall ploughmen receive any other assistance, and their work must not be set up nor touched by others. Attention should be given to the firmness and sufficiency of the work below more than to its neatness above the surface.
8. The Local Committee is required to fix the time to be allowed for ploughing the portion of land, and they are recommended that the time be at the rate of not more than ten hours per imperial acre on light land, and fourteen hours on heavy or stony land.

## CLASS III.

## COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums are granted for two years.

## PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1. Best kept Cottage	.	.	.	.	.	£1	0	0
Second best	.	.	.	.	.	0	10	0
2. Best kept Cottage Garden	.	.	.	.	.	1	0	0
Second best	.	.	.	.	.	0	10	0

## RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardeners' Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the District to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.

4. To warrant the award of full Premiums, there must not be fewer than three competitors in each class. If there are less than three competitors in each class, only half Premium will be awarded.

5. A person who has gained the highest Premium cannot compete again.

6. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly; the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

7. In estimating the claims for the Garden Premiums, the judges should have in view—the sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

8. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be lodged with the Secretary of the Highland and Agricultural Society *on or before the 1st November next.*

9. When a grant of Money has expired, the District cannot apply again for aid for four years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the 1st November next.*

### MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE, POULTRY, AND BEE-KEEPING.

1. The Society will give annually one or two Minor Silver Medals to a limited number of local Associations or individuals, who establish Competitions and Premiums for Cottages, Gardens, Garden Produce, or Bee-Keeping. The Medals will be granted for two years.

2. The Medals may be offered in any two of the following sections, *but under no circumstances will the two Medals be given in one of the sections:—*

(1) Best kept Cottage or best kept Cottage and Garden. (One Medal only.)

(2) Best kept Garden. (One Medal only.)

(3) Best Collection of Garden Produce—Flowers excluded. (One Medal only.)

(4) Best Pen of Poultry.

(5) Honey. (One Medal only.)

3. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15. The occupiers of Lodges at Gentlemen's Approach Gates, and Gardeners in the employment of others, are not entitled to compete.

4. If Competition takes place for Garden Produce, such produce must be *bona fide* grown in the Exhibitor's Garden. He will not be allowed to make up a collection from any other Garden. The produce must consist of Vegetables, or Vegetables and Fruit (not Fruit alone). Flowers are excluded.

5. The Honey must be the produce of the Exhibitor's own Hives.

6. To warrant the award of a Medal, there must not be fewer than three Competitors.

7. Blank forms for Reports of Competitions will be furnished to the Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary of the Highland and Agricultural Society as soon as possible after the Show, and in no case later than *1st November*, for the approval of the Directors, against whose decisions there shall be no appeal.

8. When a grant of Medals has expired, the District cannot apply again for aid for two years, and if no competition takes place in a District for two years the grant expires.

9. Applications for these Medals must be made *before 1st November next*.

#### *Dumbarton.*

1. DUMBARTON SOCIAL UNION HORTICULTURAL.—*Convener*, John Russell, 1 Poindfauld Terrace, Dumbarton; *Secretary*, Joseph Craig, 2 Chapelton Gardens, Dumbarton. 2 Medals. 1908.

#### *Fifeshire.*

2. AUCHTERMUCHTY AND STRATHEDEN.—*Convener*, John Gilchrist, Auchtermuchty; *Secretary*, Richard Leven, Auchtermuchty. 2 Medals. 1909.
3. DYSART.—*Convener*, Henry Beveridge, 86 Salisbury Street, Kirkcaldy; *Secretary*, William Murray, 4 Rosabelle Street, Kirkcaldy. 2 Medals. 1909.
4. STRATHMIGLO.—*Convener*, John Fernie, Cash Fens, Strathmiglo; *Secretary*, Alexr. Reekie, High Street, Strathmiglo. 2 Medals. 1909.

*Kinross-shire.*

5. MILNATHORT.—*Convener*, F. J. C. Stark, Struan Park, Milnathort; *Secretary*, John Pearson, Thomanean, Milnathort. 2 Medals. 1908.

*Nairnshire.*

6. CAWDOR.—*Convener*, Alex. Ollar, Schoolhouse, Cawdor; *Secretaries*, W. R. Mackintosh and A. Grant, Viewhill, Cawdor. 2 Medals. 1908.

*Orkney.*

7. ORKNEY HORTICULTURAL, &c.—*Convener*, Alfred Baikie of Tankerness, Orkney; *Secretary*, George M. Louttit, County Buildings, Kirkwall. 2 Medals. 1909.

*Perthshire.*

8. BLAIRGOWRIE AND RATTRAY.—*Convener*, John S. Duff of Oakdene, Blairgowrie; *Secretary*, D. G. Monair, Advertiser Office, Blairgowrie. 2 Medals. 1908.
9. DUNBLANE.—*Convener*, Alexander B. Barty, County Buildings, Dunblane; *Secretary*, H. R. Hume, Ellenslea, Dunblane. 2 Medals. 1909.
10. DUNNING.—*Convener*, Wm. Whyte, Muirhead, Forgandenny; *Secretary*, Johnstone Wright, Burnbank, Dunning. 2 Medals. 1908.
11. LOGIEALMOND AND GLENALMOND.—*Convener*, Earl of Mansfield, Scone Palace, Perth; *Secretary*, John G. M'Laggan, Lethendy Cottage, Glenalmond, Perth. 2 Medals. 1908.



**FIRST EDITION.]**

**NOTE.—From 14th till 22nd July all communications should be addressed to the “Secretary’s Office, Showyard, Stirling.”**

***Address for Telegrams—“SOCIETY,” EDINBURGH.***

**Subject to Orders issued by the Board of Agriculture**

**HIGHLAND AND AGRICULTURAL SOCIETY  
OF SCOTLAND**

**GENERAL SHOW OF STOCK AND IMPLEMENTS  
IN KING’S PARK,  
STIRLING,**

**ON 20TH, 21ST, 22ND, AND 23RD JULY 1909.**

***LAST DAYS OF ENTRY.***

**IMPLEMENTS AND OTHER ARTICLES—Monday, 17th May.**

**STOCK, POULTRY, AND DAIRY PRODUCE—Friday, 11th June.**

No Entry at ordinary fees taken later than those which are received at the Society’s Office, Edinburgh, by first post, or 10 o’clock, on Friday morning (11th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry and Dairy Produce at double fees) till Wednesday morning (18th June), at the Society’s Office, Edinburgh, at 10 o’clock.

**President of the Society.**

**THE DUKE OF MONTROSE, K.T.**

**Chairman of the Board of Directors.**

**ALEX. CROSS OF KNOCKDON.**

**Convener of the Local Committee.**

**DAVID WILSON, D.Sc., OF CARBETH.**

**The District connected with the Show comprises the Counties of Stirling, Clackmannan, Dumbarton, and Perth (Stirling Show Division).**

**REGULATIONS.**

**GENERAL CONDITIONS.**

1. The Competition, except where otherwise stated in the Premium List, is open to Exhibitors from all parts of the United Kingdom.
2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Monday, 17th May, for Implements and other Entries.*

*Articles, and Friday, 11th June, for Stock, Poultry, and Dairy Produce.* No Entry taken at ordinary fees later than those which are received at the Society's Office by first post, or 10 o'clock, on Friday morning, 11th June. Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry and Dairy Produce at double fees) till Wednesday morning (16th June), at the Society's Office, Edinburgh, at 10 o'clock. Printed forms of Entry will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders for Exhibits and Attendants will be forwarded to Exhibitors, by post, previous to the Show.

*Licences  
for moving  
Stock.*

3. This Premium List is published and the Show will be held subject to any Orders that may be issued by the Board of Agriculture or Local Authorities. Any licences that may be required for the movement of Stock into or away from the Show must be obtained by Exhibitors. For licences for admission of Stock to the Show, application should be made to Mr J. M. Stewart, V.S., Murray Place, Stirling.

4. No Entry can be received or recorded unless it is accompanied by the necessary fees, and complies fully with the Regulations in the Premium List.

*Particu-  
lars of  
Entries.*

5. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor. The Society shall have power at any time to call upon an Exhibitor to furnish proof of the correctness of any statement in his entry.

6. The name of the Breeder, if known, must be given, and if the Breeder is not known, a declaration to that effect, signed by the Exhibitor, must be made on the Entry Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown.

*No substi-  
tution of  
Animals.*

7. All animals, except calves, foals, and lambs shown with their dams, must be entered in the classes applicable to them, and cannot be withdrawn after entry, or other animals be substituted in their place.

*One Class  
only.*

8. For prizes given by the Society, no animal shall be allowed to compete in more than one class, or to compete in any class except that prescribed for animals of its pedigree and description; but this Rule does not apply to the Jumping and Driving Competitions.

*Ownership.*

9. All stock exhibited at the Show, except where otherwise stated in the Premium List, must be from the time of entry to the date of the competition the *bona fide* property of the Exhibitor in whose name it is entered.

*Responsi-  
bility for  
Entries.*

10. Exhibitors are alone responsible for the accuracy and eligibility of their entries. The recording of an entry or the admission of the exhibit to the Showyard will not relieve the Exhibitor of this responsibility. The entry-fee paid for an animal entered in a class for which it is not eligible is not returnable.

*Society not  
liable.*

11. The Society shall not be liable for any loss or damage which Stock, Poultry, Dairy Produce, Implements, or other articles may sustain at the Show, or in transit.

*Disquali-  
fied Ex-  
hibitors.*

12. The Society reserve to themselves the right of refusing, cancelling, or prohibiting the exhibition of entries from any person who, after 1st January 1904, has been expelled from the membership of any Agricultural or Dairy Society, or who may have been prohibited, suspended, or disqualified from making entries or exhibiting at the Show or Shows of any Agricultural or Dairy Society or Breed Society in consequence of having attempted to obtain a Prize by giving a false Certificate, or by other unfair means, or who is under exclusion from any Breed Society for fraudulent practices.

*Animal  
disquali-  
fied.*

13. When an animal has previously been disqualified by the decision of any Agricultural Society in the United Kingdom, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to

state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

14. Any artificial contrivance or device of any description found on or proved to have been used on an animal, either for preventing the flow of milk or for any other improper purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal may be prohibited from again entering Stock for any of the Society's General Shows, for such a period as the Directors may see fit. *Tampering with Animals.*

15. The Society further reserve to themselves the right of refusing any entries they may think fit to exclude, or to cancel any entry made, or to prohibit the exhibition of any entry. *Rejecting Entries.*

16. Stock entered for competition, and actually in the Show, is subject to the control and under the orders of the Stewards, Secretary, and other Show officials of the Society, and such stock may not be withdrawn from competition without the consent of the Stewards or Secretary. *Control of Exhibits.*

17. Persons making insulting remarks to, or in any way unduly interfering with, the Judges, Stewards, or other officials while in the performance of their duties, and all Exhibitors or others in charge of stock while in the judging rings refusing to accept or display tickets, rosettes, &c., awarded by the Judges, and handed to them by the Stewards or other officials, or tearing up tickets, rosettes, &c., so awarded and handed to them, or of any similar conduct, shall be considered guilty of misconduct, and shall be dealt with under these rules. *Improper Conduct.*

18. All persons in charge of stock or other exhibits, and all persons admitted into the Showyard, shall be subject to the rules of the Society, and shall obey the orders of the Stewards, Secretary, and other officials of the Society. Exhibitors shall be answerable for the conduct of their servants or representatives. *Subject to Orders.*

19. The Stewards and other officials have power to enforce the regulations of the Society in their different departments. *Power of Officials.*

20. A protest having reference to exhibits at the Show may be lodged by any person having interest. Protests having reference to competitions which take place on the first day of the Show must be lodged in writing with the Secretary at his Office in the Showyard not later than 9 A.M. on Wednesday, the second day of the Show, and parties must be in attendance at the Secretary's Office in the Showyard at 9.30 A.M. that day, when protests may be disposed of. Protests relating to competitions taking place after the first day of the Show must be lodged before 5 P.M. on the day on which the particular exhibition takes place. Each protest must state specifically the grounds of objection, and must be accompanied by a deposit of £3, 2s., which deposit may, if the objection be proved frivolous to the satisfaction of the Directors, be forfeited. Protests may be lodged at any time by Directors, and in this case no deposit will be required. Protests will be heard and determined by the Directors. Protests on veterinary grounds not received. *Protests.*

21. The violation of any one of the regulations, or disobedience of the orders of the Directors, Stewards, Secretary, or other officials of the Society, shall render the offending person liable to the forfeiture of all premiums awarded to him, or of such a portion as the Directors may ordain, and also liable to be expelled from the membership of the Society, and disqualified from again, or for a certain number of years, exhibiting at the Shows of the Society, or to have his case disposed of by fine or otherwise as the Directors may determine. *Penalties for Offences.*

22. The decision of the Directors shall, in every matter arising at or in connection with the Show, be final; and every person present at the Show, whether as a Judge, Exhibitor, Visitor, or otherwise, shall be deemed thereby to have agreed to refer the subject-matter of such decision to the final determination of the Directors to the exclusion of all Courts of Law. *Final Authority.*

*Intimating Decisions.* 23. All decisions under these rules may, along with the names and addresses of the persons against whom such decisions have been pronounced, be communicated by the Secretary of this Society to the Secretaries of all Agricultural or Dairy Societies holding open Shows in the said United Kingdom, and to the Secretaries of all Breed Societies in said United Kingdom, and may be published in the Annual Reports of this Society, and in such newspapers or journals as the Directors may determine; and every Exhibitor competing at the Show, and every person present at the Show, whether as a Director, Member of Committee, Steward, Judge, Exhibitor, Visitor, or otherwise, shall be deemed thereby to have consented to such communication and publication.

*Former Winners.* 24. An animal to which a first Premium has been awarded, even if it should not qualify for that Premium, or an animal which subsequently becomes entitled to a first Premium, at a General Show of the Society, cannot again compete in the same class, notwithstanding any alteration in the heights stated for such class, but may be exhibited as Extra Stock.

*Herd-books.* 25. Shorthorn, Aberdeen-Angus, Galloway, and Highland cattle must be entered in the herd-books, or the Exhibitor must produce evidence that his animal is eligible to be entered therein.

*Height of Horses.* 26. All Horses or Ponies entered in classes in which a particular height is stated shall before being judged be measured with their shoes on. No subsequent measuring or alteration of shoes will be permitted.

*Overfeeding.* 27. Breeding Stock must not be shown in an improper state of fatness, and the Judges are requested not to award Premiums to overfed animals; and no Cattle or Sheep which after the age of twelve months have been exhibited as Fat Stock at any Show are eligible to compete in the Breeding Classes for the Society's Prizes.

*Sires.* 28. Aged Bulls and Stallions must have had produce, and, along with two-year-old Bulls, three-year-old Colts, and two-shear and aged Tups, have served within the twelve months immediately preceding the Show.

*Cows.* 29. Except as may be otherwise specially provided in this Premium List, cows of all breeds (other than Ayrshire) must have had a calf within nine months previous to the Show, and when exhibited must be in milk. Animals of any age that have had a calf must be shown as Cows.

*In-calf Heifers.* 30. Two-year-old Heifers of the Shorthorn, Aberdeen-Angus, and Galloway breeds, two-year-old Yeld Ayrshire Heifers, and three-year-old Highland Heifers, must be in calf when exhibited, and the Premiums will be withheld till birth be certified, which must be within 9 months after the Show.

*Mares.* 31. A Mare entered in a class for "Mares with foal at foot" must have produced a foal after 1st January of the year of the Show, must have regularly nursed her own or another foal, and must have the foal with her in the Show. If the mare's own foal is alive it must be the foal shown with the mare. In the case of a Mare that has not foaled before the Show, or whose foal has died, she shall, if not in milk, be eligible without further entry to compete among the Yeld Mares if a corresponding class for Yeld Mares be included in the Premium List. Agricultural Yeld Mares must produce a foal within 12 months from the first day of the Show. A Mare in a class for "Mares or Geldings" may or may not have had a foal in the year of the Show, but shall not have her foal exhibited with her, nor be in milk at the time of the Show.

*Sows.* 32. All Sows farrowed prior to the year before the Show must have produced a litter of pigs in the year of the Show prior to the opening day. Sows farrowed in the year prior to the year of the Show must either have produced a litter of pigs prior to the Show, or produce a litter within three months of the last day of the Show. Certificates of the date of farrowing must be supplied in every case.

33. With reference to Regulation 30, birth of a live or full-time

calf must be certified; and in regard to Regulation 31, birth of at least a nine months' foal; or in the case of the death of the dam, a Veterinary Surgeon's certificate must be produced certifying that at the time of death the animal was so far advanced with calf or foal that if it had lived it would have produced a calf or foal within the periods stated in Rules 30 and 31. Certificates of calving required by the foregoing Regulations must reach the office of the Secretary within ten months, farrowing certificates within four months, and foaling certificates within thirteen months, of the last day of the Show. In default of this, the animal will be regarded as having failed to fulfil the Regulations, and the prize will therefore pass to the animal next in order of merit or be forfeited.

*Calves and Foals.*

*Calving, Farrowing, and Foaling Certificates.*

34. Except when otherwise provided, the awards of Special Prizes shall not be subject to the Regulations as to calving and foaling.

*Special Prizes.*

35. The Premiums awarded, except those withheld till birth of calf or foal or litter of pigs is certified, will be paid as soon after the Show as practicable, and, with the exception of the Tweeddale Gold Medal, Special Cups, and Medals, may be taken either in money or in plate.

*Payment of Prizes.*

36. In the classes for Hunters, Judges are empowered to transfer to the proper classes horses which, in regard to weight-carrying, are in their opinion entered in the wrong classes.

*Hunters.*

37. Judges are particularly requested to satisfy themselves, as far as possible, regarding the soundness of all Horses before awarding the Prizes, and to avoid giving Prizes to animals showing symptoms of hereditary diseases. The Judges may consult the Society's Veterinary Surgeon if they deem it expedient. No protests on veterinary grounds will be received.

*Soundness of Horses.*

38. All Ewes must have reared lambs in the year of the Show; and Ewes of the Blackface and Cheviot breeds must be in milk, and have their lambs at foot.

*Ewes.*

39. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, the year of the Show.

*Poultry.*

40. Railway Certificates for Stock and Implements are issued to Exhibitors before the Show along with their Tickets of Admission, one Certificate for the outward and another for the return journey being sufficient for each Exhibitor for any number of exhibits.

*Railway Passes.*

41. Poultry and Stock will be admitted on Monday, the day before the opening of the Show, and, with the exception of Horses, must be in the Yard before 12 o'clock that night. Horses must be in before 8 o'clock on the morning of Tuesday, except those entered in classes for which other times for arrival are elsewhere stated in this List. Judging begins at 10 A.M. on Tuesday. Exhibited on Tuesday, Wednesday, Thursday, and Friday. Stock may be admitted on the Saturday preceding the Show, but only by sending two days' prior notice to the Secretary.

*Admission of Stock.*

42. Horses and Cattle must be paraded at the times stated in the Programme of the Show, and when required by the Stewards, and under their direction. In Parade, Horses must be ridden or led as provided in their respective classes. Prize and commended Cattle and Horses will receive two rosettes each, which must be attached to the head of the animal, one on each side. Attendants must be beside their animals *twenty minutes before the hour of Parade*, and be ready to proceed to the ring immediately on receiving the order of the Stewards. Infringement of this Rule, or failure of any attendant to obey the orders of the Society's officials, will render the Exhibitor liable to a fine of 20s. for each separate infringement or act of disobedience, and to the forfeiture of any or all of the Prizes awarded to him at this Show.

*Parades.*

43. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others in charge of their Stock, and shall be

*Responsibility of Exhibitors*

responsible for the condition of their animals during the whole time they remain in the Showyard.

*Moving from stalls.* 44. No animal shall be taken out of its stall after 10 A.M. during the Show except by order of the Stewards, or with permission of the Secretary.

*Washing Cattle.* 45. Cattle shall not be taken out of their stalls to be washed after the Judging has been commenced. Cattle must not be washed beside the Judging Rings. Those infringing this Rule shall be liable to a fine of 10s.

46. Soap or other adhesive material must not be used in dressing cattle or horses. Infringement of this Rule will render the animal upon which the material is used liable to be disqualified.

*Accommodation.* 47. Loose-boxes will be provided for all horses; covered accommodation for other live stock. Boxes (floored) for attendants on Cattle, Horses, Sheep, and Pigs will be provided at a charge of 20s. for each box for members; 25s. for non-members.

*Floored boxes and stalls for Animals.* 48. Exhibitors requiring the boxes, stalls, or pens for their animals to be floored must give instructions to the Showyard contractors, Messrs Macandrew & Co., Showyard, ten days before the Show opens. (For charges, see Rule 70.)

*Securing Cattle.* 49. Bulls must be secured by nose-rings, with chains or ropes attached, or with strong halters and double ropes. All Cattle, other than Highland Cattle, must be tied in their stalls.

*Concealing Animals.* 50. During the time the Show is open to the public no rug shall be hung up so as to conceal any animal in a horse-box or stall, except with the special permission of the Steward of that department.

*Fodder.* 51. Five days' supply of straw, hay, grass, and tares will be provided free by the Society. Any additional fodder or other kinds of food required will be supplied at fixed prices in the Forage-yard. Any servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, or straw. Coops, food, and attendance for Poultry will be provided by the Society.

*Feeding appliances.* 52. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope or sheep-net to carry their forage. Mangers, sheep and pig troughs, will be provided.

*Sawdust.* 53. Sawdust must not be used as bedding for Stock.

*Water.* 54. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

*Lights and Smoking.* 55. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the Sheds. Those infringing this Rule shall be liable to a fine of 10s.

*Removal of stock.* 56. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 P.M. on Friday, the last day of the Show, except on certificate by the Veterinary Surgeon employed by the Directors, countersigned by the Steward of the department or the Secretary.

*Withdrawal of horses over night.* 57. At the close of the Show on Tuesday, Wednesday, and Thursday, horses may be withdrawn for the night on a deposit of £5 for each animal, which shall be forfeited, along with any prize money it may have gained, if the animal is not brought back. They must return between 7 and 7.30 the following morning, and those not in before 8 shall forfeit 10s. Horse passes to be applied for at the Secretary's Office between 5 and 6 P.M. on Tuesday, and the deposit, unless forfeited in whole or in part, will be returned between 12.30 and 2.30 on Friday.

*Order in removal.* 58. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule shall be liable to a fine of 10s., and to be detained till all the other Stock is removed.

*Penning and* 59. Poultry may be penned before the opening and removed at the close of the Show by Exhibitors themselves or their representatives.

In the event of neither the Exhibitor nor an authorised representative of the Exhibitor being present to pen or remove Poultry, the birds will be penned and removed by men hired and paid by the Society, but this will be done on the understanding that the men are hired to do the work on behalf of Exhibitors, and solely at their risk, and that the Society will be in no way responsible for expenses incurred or loss of or injury to Exhibits by errors or accidents in penning, despatching, or conveying Exhibits. *removing Poultry.*

60. On the opening day of the Show the Poultry Shed will be closed to the public during the Judging. On the last day of the Show the Poultry Shed will be closed to the public at 4 P.M.; at 5 P.M. Exhibitors or their representatives will be admitted to the Shed to remove Exhibits, provided the Exhibitor has, *not later than 11 A.M. on the last day of the Show*, given written notice to the Secretary to the effect that the Exhibitor or the Exhibitor's representative will attend at the Poultry Shed at 5 P.M. to remove the birds. *Closing of Poultry Shed.*

### JUDGING STOCK AND POULTRY.

61. On Tuesday, the first day of the Show, no person will be admitted, except Servants in charge of Stock, till 8 A.M., when the Gates are opened to the public. *Opening Gates.*

62. The Judges will commence their inspection at 10 A.M. The spaces reserved for the Judging will be enclosed, and no encroachment shall be permitted. *Judging.*

63. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the Premiums offered, it shall be in their power to award a lower prize. *Insufficient merit.*

64. In addition to the Premiums, the Judges may award one Very Highly Commended, one Highly Commended, and as many Commended tickets in each class as they consider justified by the number and merit of the entries. *Commendations.*

65. Ayrshire Cows which have not calved before the Show, whether entered in a class for Cows in Milk or for Cows in Calf, shall be judged along with the Cows in Calf, and Ayrshire Cows or Heifers which have calved before the Show—in whichever of the classes entered—shall be judged along with Cows in Milk, subject to complying with the conditions of the Milk Test prescribed in Rules 65a and 65b. *Ayrshire Cows and Heifers.*

65a. Ayrshire Cows in Milk must be in their stalls in the Showyard before 6 P.M. on the Sunday preceding the opening of the Show, must be milked dry, to the satisfaction of the Society's Officials, between 6 and 7 o'clock on that evening, and on the following day—the day before the opening of the Show—be milked at 6 A.M. and 6 P.M. in the presence of the Society's Official, who will weigh each cow's milk at each of these two milkings, and record the weights in a book provided for the purpose, the Official also entering in the same book the time occupied in milking each cow at each of the two milkings. A period of fifteen minutes is allowed for milking each aged cow; no time limit is imposed for milking three-year-old cows. *Judging Ayrshire Cows.*

65b. Aged Cows whose yield of milk at these two milkings does not equal or exceed 36 lb., and three-year-old cows whose yield at the two milkings does not equal or exceed 27 lb., will be disqualified for competing at the Show. Cows that may calve in the Show will not be eligible to compete unless they qualify in the foregoing Milk Test. *Milk Test.*

66. Attending Members will accompany each section of the Judges. It will be the duty of Attending Members to bring the animals out to the Judges and to see that no obstruction is offered to them, and that the space reserved for them is not encroached upon; to ticket the prize *Attending Members.*

animals; to send the Nos. of prize animals to the Award Lectern at the Members' Pavilion; to assist the Judges in completing their return of awards; and should any difficulty arise, to communicate with the Stewards or Secretary.

67. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or attending Member in any class in which he is competing.

### DAIRY PRODUCE.

68. Dairy Produce will be received in the Showyard on Monday, the day before the opening of the Show, and till 8 A.M. on Tuesday, the first day of the Show. Judged at 10 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday.

*Placing  
and re-  
moving  
Dairy  
Produce.*

69. Dairy Produce must have been made on the Exhibitor's farm in the year of the Show. No Exhibitor shall show more than one lot in each class. Exhibits of Dairy Produce may be placed before the opening and removed at the close of the Show by Exhibitors themselves or their representatives. In the event of neither the Exhibitor nor an authorised representative of the Exhibitor being present to place or remove exhibits, they will be placed and removed by men hired and paid by the Society, but this will be done on the understanding that the men are hired to do the work on behalf of Exhibitors, and solely at their risk, and that the Society will be in no way responsible for expenses incurred or loss of or injury to exhibits by errors or accidents in placing, despatching, or conveying exhibits. In the case of exhibits which are not removed by 5.30 P.M. on the closing day of the Show, the Society will hold itself at liberty to hand them over to the railway companies for despatch to the respective Exhibitors.

### STALL RENT (INCLUDING ENTRY FEE).

70. The following rates (which include Entry Fees and Stall Rent) shall be paid by Exhibitors when making their Entries:—

	Members. s. d.	Non-Members. s. d.
Stalls for Cattle, each . . . . .	15 0	25 0
Ayrshire Cows in milk and in calf, and Jersey Cattle, Classes 28, 29, 30, 33, 34, and 35 (enclosed stalls) . . . . .	25 0	35 0
Boxes for Horses in Classes 36, 37, 38, 43, 53, 54, 55, 59, and 60 . . . . .	30 0	40 0
Boxes for Horses in Classes 39, 40, 41, 42, 44, 45, 46, 47, 48, 49, 50, 51, 52, 56, 57, 58, 61, 62, 63, 64, 65, 66, 67, 68, 69, 75, and 76 . . . . .	22 6	32 6
Boxes for Ponies in Classes 70, 71, 72, 73, and 74 . . . . .	20 0	30 0
Animals in other Classes also entered for Driving, 5s. each extra.		
Shed Accommodation for Machines for driving competitions, each . . . . .	5 0	10 0
Sheep or Swine, per pen . . . . .	10 0	15 0
Poultry, each entry . . . . .	2 0	3 0
Dairy Produce, each entry . . . . .	4 0	6 0
Covered Booths for offices, 9 feet by 9 feet . . . . .	70 0	100 0
Newspaper offices . . . . . £2, 10s.		
Attendants' Boxes (see Rule 71) . . . . .	20 0	25 0

*Floored Stalls.*—Exhibitors desiring the boxes, stalls, or pens for their animals to be floored can have this done by, ten days before the

opening of the Show, giving instructions to the contractors, Messrs Macandrew & Co., the Showyard, to whom the following charges for flooring have to be paid: Horses, 10s. each; Ponies, Cattle, Sheep, and Swine, 7s. each.

*Entries in more than one Class.*—In the case of animals entered in more than one class, the entry fee, whether for Post or ordinary Entries, shall be five shillings for each class after the first. This does not apply to the Jumping Competitions.

### ACCOMMODATION FOR ATTENDANTS.

71. Boxes for accommodation of attendants on Stock will, if desired, be provided beside the Stock at a charge of 20s. per box for members and 25s. for non-members. Attendants' boxes will be floored and lined with wood, with door. Applications for attendants' boxes must accompany entries of Stock, and Exhibitors must state next to which animal the the attendants' box is to be placed.

### IMPLEMENTS AND OTHER ARTICLES.

72. Implements will be received in the Yard from Tuesday, 13th July, till 5 o'clock on the afternoon of Monday, 19th July. Exhibited Tuesday, Wednesday, Thursday, and Friday. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and prices must be stated. *Admission.*

73. No Money Prizes or Medals, except when specially offered, will be given by the Society for Implements of any kind. *Premiums.*

74. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary is entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition. *Refusing Entries.*

75. In order to encourage exhibits of Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show, open space will be provided for these in some less prominent part of the Yard at a charge of 10s. for space 10 feet wide and 20 feet deep. *Local Operatives.*

76. Every article to be exhibited must be entered on the Society's Entry Form. Any article not so entered that is taken to the Show is liable to be ordered out of, or removed from, the Showyard, or confiscated to the Society. Exhibitors infringing this rule are moreover liable to a fine of £1. *Articles not entered.*

77. "Cheap-Jacks" are not admitted to the Showyard. The selling of goods by auction, shouting, and other behaviour calculated to annoy visitors or Exhibitors, are strictly forbidden. Exhibitors infringing this Regulation are liable to a fine of £1, and to have themselves and their goods ordered out of, or removed from, the Showyard, or to have their goods confiscated to the Society. *Selling by auction and noisy behaviour forbidden.*

78. The articles of each Exhibitor must be all placed in one stand, except Implements in motion, and must not on any account extend beyond the allotted space. No article shall be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 p.m. on Friday. Those infringing this Rule shall be liable to a fine of 10s. *Placing Exhibits. Removing Exhibits.*

79. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor. Failing this being done, the Society shall be at liberty to restore the ground and charge the cost to the Exhibitor. *Restoring Turf.*

80. Exhibitors must arrange their own articles within the space

- Arranging Exhibits.** allotted to them before 9 o'clock on Tuesday, and to the satisfaction of the Stewards in charge of the Implement Yard. Exhibitors are prohibited from subletting space allotted to them, and from displaying the name of any other firm on their Stand. All signs, except signs on gables, must face the front only. Nails must not be driven into the canvas.
- Signs.**
- Handbills.** 81. Exhibitors are not allowed to distribute handbills anywhere in the Yard except at their own Stand; and they must not for this or any other purpose encroach upon the adjacent alleys or open spaces.
- Sweeping Stands, &c.** 82. Exhibitors are required to have their Stands and the portions of the alleys immediately adjoining them swept up before eight o'clock on each morning of the Show.
- Fuel.** 83. All Machines requiring steam or fire must be entered as such in the Certificate, and will be placed in the Motion Yard. *Coke only shall be used in all cases where fire is required.* Coal shall not be used at any time in the Showyard. Those infringing this Rule shall incur a penalty of £5.
- Steam Engines.** 84. No Steam Engine shall be driven in the Yard at a greater speed than 4 miles an hour. Traction Engines shall not be used in conveying Exhibits or other goods into, from one place to another in, or out of the Showyard. Without written permission by the Steward of Implements or Secretary, Motor Waggons shall not be used in conveying goods into or out of the Showyard.
- Motors.**
- Traction Engines.** 85. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Secretary or Stewards, and must not leave their stands till 6 P.M. on Friday.
- Consigning Implements.** 86. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement, as well as the number of the Exhibitor's stand.
- Photographing in Showyard.** 87. The carriage of all Implements must be prepaid.  
88. Photographing in the Showyard is not permitted, except by photographers having a Stand in the Showyard or holding a "Photographer's Ticket." The "Photographer's Ticket" may be had from the Secretary, price 15s. It admits the holder to the Show when open to the public, and entitles him to photograph in the Showyard, subject to arrangements made by the Stewards.
- Covered Booths.** 89. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members and £5 to Non-Members.
- Exhibitors' and Attendants' Tickets.** 90. Each Exhibitor in the Implement Department who is not a Member of the Society will receive one free Ticket of Admission to the Showyard for himself or a member of his firm, and will receive, in addition, for the use of attendants employed by him at his Stand, two Tickets of Admission for each complete ten feet of shedding in the Motion Yard, and one Ticket for each complete ten feet of shedding in the other sections. No additional Free Tickets can be issued in any circumstances whatever. Additional Attendants' Tickets, not more than five for one Exhibitor, may be obtained by application in writing by the Exhibitor at 5s. each.
- Tickets to be filled up and signed.** 91. The Tickets of Admission for Exhibitors and Attendants referred to in the foregoing Regulation will (about fourteen days prior to the Show) be issued to the Exhibitors in blank, with the number of the Exhibitor's Stand. The name of the person for whom each ticket is intended must be written on it before it is used. Each person holding a Free Ticket of Admission must sign his or her name on the back thereof, and must also, when required, sign his or her name in the book at the Entrance Gate. Exhibitors' attendants are strictly cautioned not to lend or transfer their Tickets, which can be used only by the persons whose names they bear, and who must be *bona fide* acting for, or employed by, the Exhibitor. No Ticket is transferable. An Exhibitor is liable to a fine of £1 for each case of transfer or other improper use of a Ticket issued to himself or employee.
- Tickets not Transferable.**
- Improper use of Tickets.**

92. The following are the arrangements for the admission of Supplies (Refreshments or other goods) for Stand-holders during the Show: Messenger on foot (with or without hand-barrow) with supplies, admitted by Special Ticket; price for one admission, 1s., for the four days, 3s. Horse vehicle and driver with supplies, admitted by Special Ticket; price for one admission, 1s., for the four days, 5s. These Special Tickets may be had from the Secretary. Horse vehicles, with supplies, admitted throughout the day on the first day of the Show; on the other three days they will not be admitted between the hours of 10 A.M. and 5 P.M. except by written permit from the Secretary.

*Admission  
of Supplies  
for Stand-  
holders.*

93. The riding of Cycles in the Showyard is prohibited.

*Cycles.*

94. The Society reserves the right to allot to applicants for Stands either the whole or part of the space they ask for.

*Allocation  
of space.*

95. The Society will not be responsible for any accident that may occur from the machinery belonging to any Exhibitor; and it is a condition of entry that each Exhibitor shall hold the Society harmless, and indemnify it against any legal proceedings arising from any accident caused by his machinery.

*Accidents.*

96. The giving of Alcoholic Drinks to visitors at Stands in the Show is strictly prohibited.

*Alcoholic  
Drinks.*

97. Exhibitors desiring the use of gas in the Showyard will please apply to Mr J. D. Smith, Stirling Gas Light Company, Thistle Street, Stirling.

*Gas.*

#### STALL RENT.

98. Ground to be taken in spaces of 10 feet frontage by 20 feet deep, except in Motion Yard, which is to be 10 feet or any larger amount of frontage by 50 feet deep. Exhibitors must take their space in one or other of the following Sections. Space is not let partly covered and partly open. Exhibits not in motion may be excluded from the Motion Yard. The space in the Motion Yard being limited in extent, and intended mainly for exhibits in motion, not more than one-fifth of the space allotted to any one Exhibitor—and in no case more than 400 square feet—may be occupied in the Motion Yard by exhibits not in motion.

99. Rates for space, payable by Exhibitors when making their Entries:—

	Members.	Non-Members.
Space without Shedding, 20 ft. deep, per 10 ft.	£1 5 0	£1 15 0
Special Space, without Shedding, 20 ft. deep, per 10 ft.	2 0 0	2 10 0
Ordinary Shedding, 20 ft. deep, 7 ft. to eave, per 10 ft.	1 5 0	1 15 0
Ordinary Shedding, 20 ft. deep, 7 ft. to eave, <i>boarded at back</i> , per 10 ft.	1 12 0	2 2 0
Special Shedding, 20 ft. deep, 7 ft. to eave, per 10 ft.	2 0 0	2 10 0
Special Shedding, 20 ft. deep, 7 ft. to eave, <i>boarded at back</i> , per 10 ft.	2 7 0	2 17 0
*Space in Motion Yard, without Shedding, 50 ft. deep, per foot	0 5 0	0 8 0
*And with Shedding, 20 ft. deep, 10 ft. to eave, per foot	0 7 0	0 10 0
Covered Booths for offices, 9 ft. by 9 ft., each	3 10 0	5 0 0
Newspaper offices, each	£2, 10s.	

#### ADMISSION OF THE PUBLIC.

The public will be admitted daily at 8 A.M. Judging begins on Tuesday at 10 A.M. The charges for admission to the Yard will be—Tuesday, from 8 A.M. till 5 P.M., 5s. Wednesday, from 8 A.M. till 5 P.M., 3s. Thursday, from 8 A.M. till 5 P.M., 2s.; from 5 P.M. till 8 P.M., 1s. Friday, from 8 A.M. till 5 P.M., 1s.

#### ADMISSION OF MEMBERS AND EXHIBITORS.

On exhibiting their "*Member's Ticket*," which is strictly non-transferable, Members of the Society are admitted free to the Showyard and

\* See Rule 98.

(provided there is room) to the Enclosures and Stands around the Large Ring, excepting the Reserved Seats in the Grand Stand, and such other parts as may be specially reserved. Tickets will be sent to all Members residing in the United Kingdom whose addresses are known, and on no account will duplicates be issued. All Members not producing their tickets must pay at the gates, and the admission money will not on any account be returned. Tickets must be signed by Members before being presented at the gate.

Tickets of admission to the Showyard are sent to Exhibitors of Stock, Poultry, and Dairy Produce (not Members) whose Entry Fees amount to not less than 10s.

For Exhibitors of Implements and their assistants tickets are issued as provided in the Regulations for Implements.

### RESERVED SEATS IN GRAND STAND.

*For Charges and Tickets, apply to Secretary.*

### VARIOUS.

Exhibitors may display their own Placards *inside and in front of* their stands; with this exception, no Bills of any kind other than those of the Society are permitted on any of the Show erections. No newspapers or any other article to be carried about the Yard for sale or display.

*No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath-chairs may be brought in.*

Premium Lists, Regulations, and Certificates of Entry may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

*All Communications should be addressed to JAMES MACDONALD, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh. From 14th to 22nd July to the Secretary's Office, Showyard, Stirling.*

*Address for Telegrams—"SOCIETY," EDINBURGH.*

### LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 17th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Friday, 11th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Friday morning (11th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry and Dairy Produce at double fees) till Wednesday morning (16th June), at the Society's Office, Edinburgh, at 10 o'clock.

### RAILWAY ARRANGEMENTS.

The Railway Companies will be furnished with a list of the Exhibitors of Stock and Implements, after the 30th June. All applications for horse-boxes and trucks, and for information as to arrangements of Special Trains, must be made by the Exhibitors themselves to the Stationmaster where their stock is to be trucked.

*The arrangements made by the Railway Companies for the conveyance of Live Stock and Goods to and from the Show are indicated below, but exhibitors are recommended to apply to the respective companies for full particulars:—*

1. Live Stock and Goods to the Show to be charged ordinary rates.
2. Live Stock and Goods from the Show, *if sold*, to be charged ordinary rates.
3. Live Stock and Goods from the Show, *if unsold*, to be carried at half rates back to the station whence they were sent, at owners' risk, on surrender of a certificate from the Exhibitor to the effect that they are really unsold; failing surrender of such certificate, ordinary rates must be charged. The reduction

to half rate is to be allowed only when the animals or goods are consigned to be returned by the same route as that by which they were conveyed to the Show, but it shall be in the option of the Railway Company or Companies to return the animals or goods at half rates by a different route. The minimum charge for Stock returned at half rates will be one-half the ordinary minimum.

*If the unsold Live Stock which was carried on the outward journey by Passenger Train in horse-boxes be required to be returned by Goods Train in cattle trucks, half the Goods Train rates must be charged.*

*If the unsold Live Stock which was carried on the outward journey by Goods Train in cattle trucks be required to be returned by Passenger Train in horse-boxes, half the Passenger Train rates must be charged.*

4. Horses and Cattle, when sent for exhibition from one Agricultural Show to another, in another part of the country, are charged the ordinary single rates in respect of each journey, from point to point, up to the last station to which they are sent for exhibition. If remaining unsold when returned from the latest Show to the originating or home station, they are—on surrender of the necessary certificates—charged half rates at owners' risk, provided such return journey is made by the line of the company by whose route it was conveyed on the outward journey, and provided the railway traversed was covered on the outward journey. If conveyed by Goods Train, Unsold Live Stock transferred from one Agricultural Show to another in another part of the country must be charged ordinary rates.

5. Unsold goods, previously carried by railway, transferred from one Agricultural Show to another, in another part of the country, will be conveyed at half rates at owners' risk, on production of certificate from the Exhibitor to the effect that they are unsold; failing production of such certificate, ordinary rates will be charged. This applies only to Goods Trains.

6. Poultry to be charged ordinary rates both ways, and will not be accepted for conveyance unless the carriage charges are prepaid.

7. Horse-boxes, or other Passenger Train vehicle, will not be provided for the carriage of Live Stock sent by Goods Train and invoiced at Goods Train rates. *For rates for Horse-boxes by Passenger and Special Trains, apply to the Railway Companies.*

8. Provender conveyed to Agricultural Shows with Live Stock will be charged ordinary rates, except so much of the same as may be required on the journey.

9. Men, certified by the owners to be *bona fide* in charge of Live Stock, to be conveyed free in the same train as the animals, as follows: One man for each consignment, except where the consignment requires more than one vehicle, when one man for each vehicle may be sent free; but no pass is given unless the charge for the consignment amounts to as much as the charge for one horse. When two or three horses forming one consignment are sent in the same horse-box, and a man is required to travel with each animal, the men may be conveyed free, provided each horse is charged at the single horse rate. Upon both the outward and homeward journeys a separate certificate and contract must be given, which must be retained by the stationmaster at the outward or homeward starting-point, as the case may be.

10. The ordinary rates charged for carriage do not in any case include delivery to, or collection from, the Show ground.

11. Agricultural Societies' Show Plant must be charged at Class C rates, station to station.

12. Tents, Canvas, and other articles carried to Shows, not for exhibition, to be charged the ordinary rates both going and returning.

13. The carriage of all Live Stock, implements, and other articles going to the Show for exhibition must be *prepaid*.

### DELIVERY CHARGES.

The following will be the Charges for the Delivery or Collection of Live Stock, Implements, and other articles between the Railway Stations at Stirling and the Show ground:—

1. General traffic, 2s. per ton (minimum charge, 1s. 6d.)
2. Implements and Machinery (Agricultural), not exceeding 1 ton each, 2s. 6d. per ton (minimum charge, 2s.)

3. Implements and Machinery (Agricultural), on their own wheels (specially hauled), not exceeding 1 ton, 3s. each.
4. Single articles, exceeding 1 ton but not exceeding 3 tons, 3s. per ton.
5. Single articles, exceeding 3 tons but not exceeding 5 tons, 6s. per ton.
6. Single articles, exceeding 5 tons, by special arrangement only, but no less charge than 8s. per ton.
7. Rustic Houses, by special arrangement only, but no less charge than 7s. 6d. per load.
8. Carriages, four-wheeled, 3s. each.
9. Carriages, two-wheeled, 2s. each.
10. Cattle, in floats, 3s. 6d. per head, minimum charge, 5s.
11. Sheep and Pigs, in floats, 1s. per head (minimum charge, 5s., and maximum charge, 7s. 6d. for each float).

### THE PRESIDENT'S CHAMPION MEDALS

A Champion Medal is given by His Grace THE DUKE OF MONTROSE, K.T., President of the Society, for the *best Animal or pen* in each of the following sections:—

- |                    |                                  |                      |                       |
|--------------------|----------------------------------|----------------------|-----------------------|
| 1. Shorthorn.      | 7. Clydesdale Stallions.         | 12. Ponies.          | 18. Border Leicester. |
| 2. Aberdeen-Angus. | 8. Draught Geldings.             | 13. Highland Ponies. | 19. Half-bred.        |
| 3. Galloway.       | 9. Clydesdale Mares and Fillies. | 14. Shetland Ponies. | 20. Shropshire.       |
| 4. Highland.       | 10. Hunters.                     | 15. Harness Horses.  | 21. Oxford-Down.      |
| 5. Ayrshire.       | 11. Hackneys.                    | 16. Blackface Sheep. | 22. Suffolk.          |
| 6. Jersey.         |                                  | 17. Cheviot.         | 23. Swine.            |

NOTE.—Animals entered as *Extra Stock* may compete for these Medals. Former Winners of the President's Medals are eligible. The Society shall have the right to photograph the Winners for publication in the 'Transactions.' At this Show no animal can be awarded more than one of these Medals.

ENTRY FEES		CLASS	CATTLE				PREMIUMS			
Members	Non-Members		SHORTHORN				First	Second	Third	Fourth
			<i>President's Medal for best Shorthorn</i>				£	£	s.	d.
15/-	25/-	1	Bull calved before 1907	.	.	.	15	10	5	3
15/-	25/-	2	Bull calved in 1907	.	.	.	15	10	5	3
15/-	25/-	3	Bull calved in 1908	.	.	.	12	8	4	2
			<b>Tweeddale Gold Medal for best Shorthorn Bull.</b>							
			<sup>1</sup> Best Shorthorn Bull in the Show, entered or eligible for entry in Coates's Herd-Book—£20.							
			<b>Breeder of best Bull of any age in the three Classes—The Silver Medal.</b>							
			<sup>1</sup> Special Prize of £10 for best Yearling Shorthorn Bull, entered in Coates's Herd-Book, belonging to an Exhibitor residing within the Counties of Argyll, Perth, Fife, Kinross, Clackmannan, Stirling, Linlithgow, Dumbarton, and Renfrew.							
15/-	25/-	4	Cow of any age in Milk	.	.	.	12	8	4	2
15/-	25/-	5	Heifer calved in 1907.	.	.	.	10	5	3	2
15/-	25/-	6	Heifer calved in 1908.	.	.	.	10	5	3	2
			<sup>1</sup> Best Shorthorn Female in the Show, entered or eligible for entry in Coates's Herd-Book—£20.							
			<b>TOTAL PRIZE MONEY . . . £158</b>							

<sup>1</sup> Given by the Shorthorn Society.

ENTRY FEES		CLASS		PREMIUMS			
Members	Non-Members			First	Second	Third	Fourth
			<b>CATTLE</b>				
			<b><sup>1</sup> ABERDEEN-ANGUS</b>				
			<i>President's Medal for best Aberdeen-Angus Animal</i>				
15/-	25/-	7	Bull calved before 1st Dec. 1906 . . . . .	15	10	5	3
15/-	25/-	8	Bull calved on or after 1st Dec. 1906 . . . . .	15	10	5	3
15/-	25/-	9	Bull calved on or after 1st Dec. 1907 . . . . .	12	8	4	2
			<sup>1</sup> Ballindalloch Challenge Cup, value £50, for the best Bull in the three Classes.				
			Breeder of best Bull of any age in the three Classes—The Silver Medal.				
			Breeder of the Winner of the Ballindalloch Challenge Cup—The Silver Medal.				
15/-	25/-	10	Cow of any age in Milk . . . . .	12	8	4	2
			<sup>1</sup> Ballindalloch Challenge Cup, value £50, for the best Cow of any age in the above Class.				
			Breeder of the Winner of the Ballindalloch Challenge Cup—The Silver Medal.				
15/-	25/-	11	Heifer calved on or after 1st Dec. 1906 . . . . .	10	5	3	2
15/-	25/-	12	Heifer calved on or after 1st Dec. 1907 . . . . .	10	5	3	2
			<sup>2</sup> Champion Gold Medal for best breeding animal of the breed in the Showyard.				
			TOTAL PRIZE MONEY . . . . .	£158			
			<b>GALLOWAY</b>				
			<i>President's Medal for best Galloway</i>				
15/-	25/-	13	Bull calved before 1st Dec. 1906 . . . . .	15	10	5	3
15/-	25/-	14	Bull calved on or after 1st Dec. 1906 . . . . .	15	10	5	3
15/-	25/-	15	Bull calved on or after 1st Dec. 1907 . . . . .	12	8	4	2
			Breeder of best Bull of any age in the three Classes—The Silver Medal.				
15/-	25/-	16	Cow of any age in Milk . . . . .	12	8	4	2
15/-	25/-	17	Heifer calved on or after 1st Dec. 1906 . . . . .	10	5	3	2
15/-	25/-	18	Heifer calved on or after 1st Dec. 1907 . . . . .	10	5	3	2
			TOTAL PRIZE MONEY . . . . .	£158			
			<b>HIGHLAND</b>				
			<i>President's Medal for best Highland Animal</i>				
15/-	25/-	19	Bull calved before 1907 . . . . .	15	10	5	3
15/-	25/-	20	Bull calved in 1907 . . . . .	15	10	5	3
15/-	25/-	21	Bull calved in 1908 . . . . .	12	8	4	2

<sup>1</sup> "The Ballindalloch Challenge Cups," value £50 each, are offered for the best Bull of any age and best Cow of any age (Heifers excluded) in the Aberdeen-Angus classes, the former presented by the late Sir George Macpherson Grant, Bart., and the latter by the late Mr C. Macpherson Grant of Drumduan. Each Cup will become the property of the Exhibitor who shall win it five times, not necessarily in succession. The breeder of the successful animals each year will receive the Society's Silver Medal, with suitable inscription.

<sup>2</sup> Given by the Aberdeen-Angus Cattle Society.

ENTRY FEES			CLASS	PREMIUMS			
Members	Non-Members	First		Second	Third	Fourth	
		£		£	£	£	
CATTLE							
HIGHLAND—continued							
Breeder of best Bull of any age in the three Classes—The Silver Medal.				12	8	4	2
15/-	25/-	22	Cow of any age in Milk . . . . .	10	5	3	2
15/-	25/-	23	Heifer calved in 1906 . . . . .	10	5	3	2
15/-	25/-	24	Heifer calved in 1907 . . . . .	10	5	3	2
TOTAL PRIZE MONEY . . . . .				£156			
AYRSHIRE							
President's Medal for best Ayrshire							
15/-	25/-	25	Bull calved before 1907 . . . . .	12	8	4	—
15/-	25/-	26	Bull calved in 1907 . . . . .	10	7	3	—
15/-	25/-	27	Bull calved in 1908 . . . . .	8	5	3	—
<sup>2</sup> Special Prize of £10 for the best Male Animal of the Ayrshire breed entered with a number in the Ayrshire Cattle Herd-Book.							
Breeder of best Bull of any age in the three Classes—The Silver Medal.				12	8	4	—
25/-	35/-	28	<sup>1</sup> Cow calved before 1906 in Milk . . . . .	10	7	3	—
25/-	35/-	29	<sup>1</sup> Cow in Milk, calved after 1st Jan. 1906 . . . . .	10	7	3	—
25/-	35/-	30	<sup>1</sup> Cow of any age in Calf, or Heifer calved in 1906 in Calf and due to calve within nine months after the Show . . . . .	10	7	3	—
15/-	25/-	31	Heifer calved in 1907 . . . . .	10	5	3	—
15/-	25/-	32	Heifer calved in 1908 . . . . .	8	5	3	—
<sup>2</sup> Special Prize of £10 for the best Female Animal of the Ayrshire breed entered with a number in the Ayrshire Cattle Herd-Book.							
TOTAL PRIZE MONEY . . . . .				£158			
JERSEY							
President's Medal for best Jersey Animal							
25/-	35/-	33	Bull, any age . . . . .	8	5	3	—
25/-	35/-	34	Cow, any age . . . . .	8	5	3	—
25/-	35/-	35	Heifer, calved in 1907 or 1908 . . . . .	5	3	2	—
TOTAL PRIZE MONEY . . . . .				£42			
Total Prize Money for Cattle, £832							

<sup>1</sup> Cows in these Classes must have produced a calf within fifteen months prior to the Show. See Rules 65a and 65b as to Milk Test.

<sup>2</sup> Given by the Ayrshire Cattle Herd-Book Society.

ENTRY FEES			CLASS	PREMIUMS			
Members	Non-Members	First		Second	Third	Fourth	
				£	£	£	£
<b><sup>1</sup> HORSES</b>							
FOR AGRICULTURAL PURPOSES							
<b>DRAUGHT STALLIONS</b>							
<i>President's Medal for best Clydesdale Stallion or Colt</i>							
30/-	40/-	36	Stallion foaled before 1906 . . . . .	20	15	10	4
30/-	40/-	37	Entire Colt foaled in 1906 . . . . .	20	15	10	4
30/-	40/-	38	Entire Colt foaled in 1907 . . . . .	20	12	8	4
22/6	32/6	39	Entire Colt foaled in 1908 . . . . .	15	10	6	4
Breeder of best Male Animal of any age in the four Classes—The Silver Medal.							
TOTAL PRIZE MONEY . . . . .				£177			
<b>DRAUGHT GELDINGS</b>							
<i>President's Medal for best Draught Gelding</i>							
22/6	32/6	40	Draught Gelding foaled before 1906 . . . . .	10	5	3	—
22/6	32/6	41	Draught Gelding foaled in 1906 . . . . .	6	4	3	—
22/6	32/6	42	Draught Gelding foaled in 1907 . . . . .	6	4	3	—
TOTAL PRIZE MONEY . . . . .				£44			
<b>DRAUGHT MARES AND FILLIES</b>							
<i>President's Medal for best Clydesdale Mare or Filly</i>							
30/-	40/-	43	Mare of any age, with Foal at foot . . . . .	20	12	7	4
22/6	32/6	44	Yeld Mare foaled before 1906 . . . . .	12	9	6	4
22/6	32/6	45	Yeld Mare or Filly foaled in 1906 . . . . .	12	9	6	4
22/6	32/6	46	Filly foaled in 1907 . . . . .	12	9	6	4
22/6	32/6	47	Filly foaled in 1908 . . . . .	12	9	6	4
Best Clydesdale Mare or Filly—Cawdor Challenge Cup, value 50 guineas. See Conditions below. <sup>2</sup>							
TOTAL PRIZE MONEY . . . . .				£167			
Total Prize Money for Clydesdales, £388							

<sup>1</sup> No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

<sup>2</sup> This Cup is offered by the Clydesdale Horse Society of Great Britain and Ireland (subject to the conditions of that Society) for the best Clydesdale Mare or Filly registered in the Clydesdale Stud-Book, entered in any of the Draught Horse classes, at the Show at which it may be competed for. The Cup must be won four times by an Exhibitor with different animals (but not necessarily in consecutive years) before it becomes his absolute property. The animal winning this Cup must be certified free from hereditary diseases. The winner of the Cup, other than the absolute winner, shall, before delivery thereof is made to him, give security to the Clydesdale Horse Society that he shall surrender the same to the Society and deliver it at the Society's office when called upon to do so. Until the Cup be won outright, the winner on each occasion will receive the Clydesdale Horse Society's Silver Medal as a memento of his winning the Cup.

ENTRY FEES		CLASS	HORSES HUNTERS	PREMIUMS		
Members	Non-Members			First	Second	Third
			<i>President's Medal for best Hunter</i>	£	£	£
22/6	32/6	48	Colt, Gelding, or Filly, foaled in 1908, the produce of thoroughbred Stallions, out of Mares of any breed	8	5	3
22/6	32/6	49	Filly, Mare, or Gelding, for field, foaled in 1907— <i>in hand</i>	8	5	3
22/6	32/6	50	Yeld Mare, Filly, or Gelding, for field, foaled in 1906— <i>in hand</i>	8	5	3
			<sup>1</sup> Best Hunter Filly in the foregoing Classes, registered or entered in the Hunter Stud-Book—Champion Gold Medal.			
22/6	32/6	51	Mare or Gelding, foaled before 1st January 1906, able to carry over 13 st. 7 lb.— <i>in saddle</i>	20	10	5
22/6	32/6	52	Mare or Gelding, foaled before 1st January 1906, able to carry any weight up to 13 st. 7 lb.— <i>in saddle</i>	15	8	4
30/-	40/-	53	<sup>2</sup> Hunter Brood Mare, with Foal at foot—£15, £8, £4.			
			<sup>3</sup> Special Prize of £20 for the best Hunter shown in the above Classes, bred in Scotland, and regularly hunted during the past season with a pack of foxhounds in Scotland.*			
			<sup>3</sup> Special Prize of £5 to the breeder of the animal winning above prize.			
			<sup>4</sup> Special Prizes by the Secretary of State for War for Remount Horses entered in the Hunter Classes—viz., for Chargers, 4 to 6 years old, 14.3½ to 15.2½ hands, £10 and £5; and for Cavalry Horses, 4 to 6 years old, 15.0½ to 15.2½ hands, £7, £5, and £3, the Remount Officer at the Show having the right to purchase the Prize Horses at their market value, provided that does not exceed the average current price of Remounts. The Prize Horses must be passed sound. Entries for these Prizes will close at the Secretary's Office in the Showyard at 6 P.M. on the first day of the Show.			
			TOTAL PRIZE MONEY . . . £110			
HACKNEYS						
<i>(All to be shown in hand)</i>						
<i>President's Medal for best Hackney</i>						
30/-	40/-	54	Brood Mare, 15 hands and upwards, with Foal at foot, or to foal this season to a registered sire . . .	10	6	4
30/-	40/-	55	Brood Mare, under 15 hands, with Foal at foot, or to foal this season to a registered sire . . .	10	6	4
22/6	32/6	56	Yeld Mare or Filly foaled in 1906 . . .	8	5	3

<sup>1</sup> Given by the Hunters' Improvement Society.<sup>2</sup> Given by Captain Clayhills Henderson of Invergowrie, R.N.<sup>3</sup> Given by Royal Caledonian Hunt.<sup>4</sup> Given by War Office.

\* For animals competing for this prize a Certificate must be furnished from the Master of the Pack to the effect that the animal has been hunted as provided.

ENTRY FEES		CLASS	HORSES	PREMIUMS		
Members	Non-Members			First	Second	Third
HACKNEYS—continued						
22/6	32/6	57	Filly foaled in 1907 . . . . .	£ 8	£ 5	£ 3
22/6	32/6	58	Filly foaled in 1908 . . . . .	8	5	3
30/-	40/-	59	Stallion foaled in or before 1906, over 15 hands . . . . .	10	6	4
30/-	40/-	60	Stallion foaled in or before 1906, over 14 and not over 15 hands . . . . .	10	6	4
22/6	32/6	61	Entire Colt foaled in 1907 . . . . .	8	5	3
22/6	32/6	62	Entire Colt foaled in 1908 . . . . .	8	5	3
All animals entered in the above Hackney Classes must be registered in the Hackney Stud-Book except in Classes 58 and 62, and animals entered in Classes 58 and 62 must be eligible for entry in the Hackney Stud-Book.						
<sup>1</sup> A Champion Prize of £10, or a Gold Medal of the same value, at the option of the Exhibitor, is offered by Hackney Horse Society for best Mare or Filly in Hackney or Pony Classes.						
TOTAL PRIZE MONEY . . . . .				£160		
PONIES						
(Classes 63 to 66 will be judged by Hackney Judges)						
President's Medal for best Pony						
22/6	32/6	63	Stallion, 3 years old and upwards, 14 hands and under—in hand . . . . .	5	3	2
22/6	32/6	64	Yeld Mare, Filly, or Gelding, 3 years old and upwards, over 13 and not over 14 hands—in saddle . . . . .	5	3	2
22/6	32/6	65	Yeld Mare, Filly, or Gelding, 3 years old and upwards, over 12 and not over 13 hands—in saddle . . . . .	5	3	2
22/6	32/6	66	Yeld Mare, Filly, or Gelding, 3 years old and upwards, 12 hands and under—in hand . . . . .	5	3	2
TOTAL PRIZE MONEY . . . . .				£40		
HIGHLAND PONIES						
President's Medal for best Highland Pony						
22/6	32/6	67	Highland Pony Stallion, 3 years old or upwards, not exceeding 14.2 hands, entered or accepted for entry in the Highland Section of the Polo Pony Stud-Book . . . . .	10	3	2

<sup>1</sup> A Mare 6 years old or more must have had a living foal. Winners of the Hackney Society's £10 Prize or Gold Medal in 1908, except at the London and Royal English Shows, excluded. The winner must be entered or accepted for entry in Hackney Stud-Book, and certified free from hereditary disease. This Gold Medal is not redeemable.

<sup>2</sup> Exhibitors desirous of entering in these Classes Ponies not yet accepted for entry in the Highland Section of the Polo Pony Stud-Book are recommended to communicate with Mr J. H. Munro Mackenzie of Calgary, Isle of Mull, who will advise as to the steps to be taken with a view to the registration of the Ponies. All entries for above Classes must be accompanied by a certificate, either from Mr Mackenzie or from Mr A. B. Charlton, Secretary to the Polo and Riding Pony Society, 12 Hanover Square, London, W., to the effect that the animals are entered or accepted for entry in the Highland Pony Section of the Polo Pony Stud-Book.

ENTRY FEES		CLASS	HORSES	PREMIUMS			
Members	Non-Members			First £	Second £	Third £	Fourth £
22/6	32/6	68	<b>Highland Pony Entire Colts</b> foaled in 1907 or 1908	10	3	2	-
22/6	32/6	69	<b>Highland Pony Mare</b> , 3 years old or upwards, not exceeding 14.2 hands, yeld or with Foal at foot, entered or accepted for entry in the Highland Section of the Polo Pony Stud-Book	10	3	2	-
			<sup>1</sup> TOTAL PRIZE MONEY . . .	£45			
<b>SHETLAND PONIES</b>							
<i>(All to be shown in hand)</i>							
<i>President's Medal for best Shetland Pony</i>							
20/-	30/-	70	<b>Stallion</b> , not exceeding 10½ hands, foaled before 1906	5	4	3	2
20/-	30/-	71	<b>Entire Colt</b> , not exceeding 10½ hands, foaled in 1906 or 1907	5	4	3	2
20/-	30/-	72	<b>Mare</b> , not exceeding 10½ hands, with Foal at foot	5	4	3	2
20/-	30/-	73	<b>Yeld Mare</b> , not exceeding 10½ hands	5	4	3	2
20/-	30/-	74	<b>Filly</b> , not exceeding 10½ hands, foaled in 1906 or 1907	5	4	3	2
			TOTAL PRIZE MONEY . . .	£70			
<b>DRIVING COMPETITIONS <sup>2</sup></b>							
<sup>3</sup> <i>President's Medal for best animal in the Classes for Horses in Harness</i>							
22/6	32/6	75	<b>Yeld Mare, Filly, or Gelding</b> , any age, in Harness, 15 hands and upwards, to be driven in the ring.	10	5	3	-
22/6	32/6	76	<b>Yeld Mare, Filly, or Gelding</b> , any age, in Harness, under 15 hands, to be driven in the ring.	10	5	3	-
			<b>Special Prize for best Pony in Class 76, under 13 hands</b>	5	-	-	-
			TOTAL PRIZE MONEY . . .	£41			
<b>Total for Horses, £854</b>							

<sup>1</sup> The Polo and Riding Pony Society give £15 towards these prizes.

<sup>2</sup> Animals entered in other Classes may be entered in the Driving Classes at an additional fee of 5s. if they are eligible.

<sup>3</sup> An animal that has won a President's Medal in another section in this Show shall not be eligible to compete for the Medal in this section.

## JUMPING COMPETITIONS

## SPECIAL REGULATIONS

(See also the Regulations on pages 57 to 64)

1. Jumping Competitions will take place on the afternoons of Wednesday, Thursday, and Friday, the 21st, 22nd, and 23rd July; and also on the evening of Thursday.
2. Entries for each day's Competitions will close at the Secretary's Office in the Showyard at 6 p.m. on the preceding day. Entries are free for Evening Jumping, and may be received till the beginning of the Competition.
3. Entry Fees.—Wednesday, £1; Thursday and Friday, 10s. for each class.
4. Accommodation for jumping horses will be provided as follows: Covered shed in which to stand during the day free of charge; or, on application to the Secretary not less than ten days before the opening of the Show, stalls or loose-boxes will be provided at a charge (in addition to the Entry Fee) of £1 for a stall, and £1, 10s. for a loose-box, which must be paid along with the Entry Fee at the time of application.
5. Horses entered for jumping only need not enter the Showyard till 12 noon on the day of Competition, and may leave the Showyard at 6 p.m. each day.
6. The Jumps may consist of Single Hurdle, Gate, Double Hurdle, Wall, and Water Jump, power being reserved by the Society to alter these, as well as the Handicaps, as may be thought desirable.

CLASS		First	Second	Third	Fourth	Fifth
	<b>WEDNESDAY.</b>					
1	Horse or Pony any height . . . . .	£ 20	£ 15	£ 10	£ 5	£ 3
	<b>THURSDAY.</b>					
2	Horse or Pony any height, Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in Class 1 . . . . .	10	8	5	3	2
	<b>FRIDAY.</b>					
3	Horse or Pony any height, Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in either of Classes 1 or 2—4 inches extra for the winner of the two first prizes in Classes 1 and 2 . . . . .	10	8	5	3	2
	Champion Prize for most points in Prizes with one or more horses in above Classes—First Prize to count five points; Second Prize, four points; Third Prize, three points; Fourth Prize, two points; and Fifth Prize, one point—the money to be evenly divided in the event of a tie . . . . .	10	—	—	—	—
	<b>THURSDAY EVENING.</b>					
	Horse or Pony any height . . . . .	5	3	2	—	—
	<b>Total Prize Money for Jumping, £129</b>					

ENTRY FEES		CLASS	S H E E P				PREMIUMS			
Members	Non-Members		BLACKFACE				First	Second	Third	Fourth
			<i>President's Medal for best pen of Blackface Sheep</i>				£	£	£	£
10/-	15/-	77	Tup above one shear . . . . .				12	8	4	2
10/-	15/-	78	Shearling Tup . . . . .				12	8	4	2
10/-	15/-	79	Ewe above one shear, with her Lamb at foot . . . . .				10	5	2	—
10/-	15/-	80	Shearling Ewe or Gimmer . . . . .				10	5	2	—
			<sup>1</sup> Best Pair of Blackface Shearling Tups, entered in the ordinary classes, bred and reared by the Exhibitor and never sold or out of his possession, £6 and 4.							
			TOTAL PRIZE MONEY . . . . .							
			£86							
			C H E V I O T							
			<i>President's Medal for best pen of Cheviot Sheep</i>							
10/-	15/-	81	Tup above one shear . . . . .				12	8	4	2
10/-	15/-	82	Shearling Tup . . . . .				12	8	4	2
10/-	15/-	83	Ewe above one shear, with her Lamb at foot . . . . .				10	5	2	—
10/-	15/-	84	Shearling Ewe or Gimmer . . . . .				10	5	2	—
			<sup>2</sup> Perpetual Challenge Cup, gifted by Mr Borthwick, value £25, for best Sheep in the Cheviot Classes.							
			TOTAL PRIZE MONEY . . . . .							
			£86							
			B O R D E R L E I C E S T E R							
			<i>President's Medal for best pen of Border Leicesters</i>							
10/-	15/-	85	Tup above one shear . . . . .				12	8	4	2
10/-	15/-	86	Shearling Tup . . . . .				12	8	4	2
10/-	15/-	87	Ewe above one shear . . . . .				10	5	2	—
10/-	15/-	88	Shearling Ewe or Gimmer . . . . .				10	5	2	—
			<sup>3</sup> Gold Medal for best pen of Border Leicester Sheep, drawn from the ordinary Classes, registered or eligible for registration in the Border Leicester Flock-Book.							
			TOTAL PRIZE MONEY . . . . .							
			£86							
			H A L F - B R E D							
			<i>President's Medal for best pen of Half-Breds</i>							
10/-	15/-	89	Tup above one shear . . . . .				12	8	4	2
10/-	15/-	90	Shearling Tup . . . . .				12	8	4	2
10/-	15/-	91	Ewe above one shear . . . . .				10	5	2	—
10/-	15/-	92	Shearling Ewe or Gimmer . . . . .				10	5	2	—
			TOTAL PRIZE MONEY . . . . .							
			£86							

<sup>1</sup> Given by Mr Charles Howatson of Glenbuck.<sup>2</sup> Given by the Cheviot Sheep Society.<sup>3</sup> Given by the Society of Border Leicester Sheep-Breeders.

ENTRY FEES			CLASS		PREMIUMS		
Members	Non- Members	First			Second	Third	
		£			£	£	
SHEEP							
SHROPSHIRE							
President's Medal for best pen of Shropshires							
10/-	15/-	93	Tup above one shear . . . . .	6	4	2	
10/-	15/-	94	Shearling Tup . . . . .	6	4	2	
10/-	15/-	95	Ewe above one shear . . . . .	5	3	2	
10/-	15/-	96	Shearling Ewe or Gimmer . . . . .	5	3	2	
TOTAL PRIZE MONEY . . . . .				£44			
OXFORD-DOWN							
President's Medal for best pen of Oxford-Down							
10/-	15/-	97	Shearling Tup . . . . .	6	4	2	
10/-	15/-	98	Shearling Ewe or Gimmer . . . . .	5	3	2	
<sup>1</sup> Best Shearling Oxford-Down Tup in Class 97 bred in Scotland, to be registered in Oxford- Down Flock-Book before prizes will be paid— £5, £3, and £2.							
TOTAL PRIZE MONEY . . . . .				£22			
SUFFOLK							
President's Medal for best pen of Suffolk Sheep							
10/-	15/-	99	Shearling Tup . . . . .	6	4	2	
10/-	15/-	100	Shearling Ewe or Gimmer . . . . .	5	3	2	
<sup>2</sup> Three Tup Lambs, uncoloured and untrimmed, except as to the squaring of the tail—£5, £3, and £2.							
10/-	15/-	101	<sup>2</sup> Three Ewe Lambs, uncoloured and untrimmed, except as to the squaring of the tail—£5, £3, and £2.				
TOTAL PRIZE MONEY . . . . .				£22			
FAT SHEEP							
10/-	15/-	102	Three Fat Lambs, any breed or cross, dropped in the year of the Show . . . . .	5	3	—	
Total Prize Money for Sheep, £440							

<sup>1</sup> Given by Oxford-Down Sheep-Breeders' Association.<sup>2</sup> Given by the Suffolk Sheep Society.

ENTRY FEES		CLASS		PREMIUMS		
Members	Non-Members			First	Second	Third
			<b>SWINE</b>			
			<i>President's Medal for best pen of Swine</i>	£	£	£
			<b>LARGE WHITE BREED</b>			
10/-	15/-	103	Boar farrowed before 1908 . . . . .	6	3	2
10/-	15/-	104	Boar farrowed in 1908 . . . . .	6	3	2
10/-	15/-	105	Boar farrowed in 1909 . . . . .	4	2	1
10/-	15/-	106	Sow farrowed before 1908 . . . . .	6	3	2
10/-	15/-	107	Sow farrowed in 1908 . . . . .	6	3	2
10/-	15/-	108	Sow farrowed in 1909 . . . . .	4	2	1
			TOTAL PRIZE MONEY . . . . .	£58		
			<b>BERKSHIRE</b>			
10/-	15/-	109	Boar, any age . . . . .	6	3	2
10/-	15/-	110	Boar farrowed in 1909 . . . . .	4	2	1
10/-	15/-	111	Sow, any age . . . . .	6	3	2
10/-	15/-	112	Sow farrowed in 1909 . . . . .	4	3	1
			TOTAL PRIZE MONEY . . . . .	£37		
			<b>Total Prize Money for Swine, £95</b>			

## EXTRA STOCK

Animals not included in the Classes for Competition may be exhibited as Extra Stock, and may receive Awards as follows:—Very Highly Commended, or Highly Commended, carrying the Medium Silver Medal; or Commended, for which the Bronze Medal is given.

Animals entered as Extra Stock are eligible to compete for the President's Medals, whether former winners of these Medals or not.

## POULTRY

*First Premium*—ONE SOVEREIGN; *Second Premium*—TEN SHILLINGS. In each Class in which there are six or more entries, a Third Prize of Five Shillings may be awarded, provided there is sufficient merit in the pens. Three or more Commendations may also be given—thus, Very Highly Commended, Highly Commended, and Commended.

*Champion Medals* are offered as follows:—

- |                                |                         |
|--------------------------------|-------------------------|
| 1. Best Cock, any Variety.     | 5. Best Pen of Ducks.   |
| 2. Best Hen, any Variety.      | 6. Best Pen of Geese.   |
| 3. Best Cockerel, any Variety. | 7. Best Pen of Turkeys. |
| 4. Best Pullet, any Variety.   |                         |

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, the year of the Show.

*Entry Fees*—Members, 2s. ; Non-Members, 3s.

DORKING—	Class	LANGSHAN . . . .	Class
<i>Coloured</i> . . . .	1. Cock		39. Cock
	2. Hen		40. Hen
	3. Cockerel		41. Cockerel
	4. Pullet		42. Pullet
<i>Silver Grey</i> . . . .	5. Cock	ORPINGTON—	
	6. Hen	<i>Black</i> . . . .	43. Cock
	7. Cockerel		44. Hen
	8. Pullet		45. Cockerel
BRAHMAFOOTRA or COCHIN-CHINA . . . .	9. Cock	<i>Buff</i> . . . .	46. Pullet
	10. Hen		47. Cock
	11. Cockerel		48. Hen
	12. Pullet		49. Cockerel
SCOTCH GREY . . . .	13. Cock	<i>Any other Variety</i> . . . .	50. Pullet
	14. Hen		51. Cock
	15. Cockerel		52. Hen
	16. Pullet		53. Cockerel
HAMBURG—			54. Pullet
<i>Black</i> . . . .	17. Cock	WYANDOTTE—	
	18. Hen	<i>Gold or Silver</i> . . . .	55. Cock
<i>Any other Variety</i> . . . .	19. Cock		56. Hen
	20. Hen		57. Cockerel
<i>Any Variety</i> . . . .	21. Cockerel		58. Pullet
	22. Pullet	<i>Black or White</i> . . . .	59. Cock
PLYMOUTH ROCK . . . .	23. Cock		60. Hen
	24. Hen		61. Cockerel
	25. Cockerel	<i>Any other Variety</i> . . . .	62. Pullet
	26. Pullet		63. Cock
MINORCA . . . .	27. Cock		64. Hen
	28. Hen		65. Cockerel
	29. Cockerel	INDIAN GAME . . . .	66. Pullet
	30. Pullet		67. Cock
LEGHORN—			68. Hen
<i>White</i> . . . .	31. Cock	GAME—	
	32. Hen	<i>Old English</i> . . . .	69. Cock
	33. Cockerel		70. Hen
	34. Pullet	<i>Modern</i> . . . .	71. Cock
<i>Any other Variety</i> . . . .	35. Cock		72. Hen
	36. Hen	<i>Indian and Old English</i>	
	37. Cockerel	<i>Game</i> . . . .	73. Cockerel
	38. Pullet		74. Pullet

BANTAM—	Class	DUCKS—	Class
<i>Game, any Variety, including Old English and Indian Game</i>	75. Cock	<i>Aylesbury.</i>	85. Drake
	76. Hen		86. Duck
<i>Any other Variety Bantam</i>	77. Cock		87. { Drake
	78. Hen		{ (Young)
			88. { Duck
			{ (Young)
ANY OTHER RECOGNISED		<i>Rouen</i>	89. Drake
BREED OF POULTRY.	79. Cock		90. Duck
	80. Hen	<i>Any other Variety</i>	91. Drake
	81. Cockerel		92. Duck
	82. Pullet	<i>Any Variety (Aylesbury excepted)</i>	93. { Drake
			{ (Young)
TABLE FOWLS—			94. { Duck
<i>Any Breed or Cross, to be judged solely as Table Fowls, and without regard to fancy points</i>	83. { Pair of Cockerels	GEESE.	95. Gander
	84. { Pair of Pullets		96. Goose
		TURKEYS	97. Cock
			98. Hen

AMOUNT OF POULTRY PREMIUMS, £171, 10s.

## DAIRY PRODUCE

No Exhibitor to show more than one lot in any Class.

*Entry Fees*—Members, 4s. ; Non-Members, 6s.

Class	Premiums.		
	1st.	2nd.	3rd.
1. Powdered Butter, not less than 7 lb.	£ 4	£ 2	£ 1
2. Fresh Butter, three 1-lb. rolls	4	2	1
3. Cheddar Cheese, 56 lb. and upwards—£5, £3, £2			£14
4. Cheese, 14 lb. and under—£3, £2, £1			10
			6
			<u>£30</u>

## EXHIBITION TRIAL OF POTATO-DIGGERS

An Exhibition Trial of New Potato Diggers or Lifters, or Old Diggers or Lifters with Radical Improvements, will be held in connection with the Stirling Show. Gold or Silver Medals may be awarded if sufficient merit is shown.

Entries close on Monday, 17th May 1909. Entries must be made on forms to be had from the Secretary.

## ABSTRACT OF PREMIUMS.

(23 Champion Medals given by HIS GRACE THE DUKE OF MONTROSE, K.T.)

## GIVEN BY THE SOCIETY.

1. Cattle . . . . .	£832 0 0
2. Horses . . . . .	854 0 0
3. Jumping . . . . .	129 0 0
4. Sheep . . . . .	440 0 0
5. Swine . . . . .	95 0 0
6. Poultry . . . . .	171 10 0
7. Dairy Produce . . . . .	30 0 0
8. Medals to Breeders, &c. . . . .	20 0 0
9. Prizes for Timber <sup>1</sup> . . . . .	20 0 0
	<hr/>
	£2591 10 0
Less Private Subscriptions . . . . .	15 0 0
	<hr/>
Given by the Society . . . . .	£2576 10 0

## CONTRIBUTED PRIZES.

1. The Shorthorn Society . . . . .	£50 0 0
*2. The late Sir George Macpherson Grant, Bart. . . . .	50 0 0
*3. The late Mr C. Macpherson Grant of Drumduan . . . . .	50 0 0
4. Aberdeen-Angus Cattle Society . . . . .	10 0 0
5. Ayrshire Cattle Herd-Book Society . . . . .	20 0 0
*6. Cawdor Challenge Cup . . . . .	52 10 0
7. Hunters' Improvement Society . . . . .	10 10 0
8. War Office . . . . .	30 0 0
9. Royal Caledonian Hunt . . . . .	25 0 0
10. Captain Clayhills Henderson . . . . .	27 0 0
11. Hackney Horse Society . . . . .	10 0 0
12. Polo and Riding Pony Society . . . . .	15 0 0
13. Mr C. Howatson of Glenbuck . . . . .	10 0 0
*14. Borthwick Challenge Cup . . . . .	25 0 0
15. Society of Border Leicester Sheep-Breeders . . . . .	10 0 0
16. Oxford-Down Sheep-Breeders' Association . . . . .	10 0 0
17. Suffolk Sheep Society . . . . .	20 0 0
18. Tweeddale Gold Medal . . . . .	16 0 0
	<hr/>
	441 0 0
	<hr/>
	£8017 10 0

<sup>1</sup> Grant to Royal Scottish Arboricultural Society for Prizes for Timber.

\* Challenge Prizes.

JAMES MACDONALD, *Secretary.*GEORGE IV. BRIDGE,  
EDINBURGH, Feb. 1909.

**The Society's Show for 1910 will be held at Dumfries  
on the 19th, 20th, 21st, and 22nd July.**



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